

MEDICAL ESSAYS

AND

OBSERVATIONS,

ABRIDGED,

From the Memoirs of the Royal Academy.

V O L. III.



CONTAINING,

- I. ANIMAL ŒCONOMY.
- II. HISTORIES of particular DISEASES.
- III. The EFFECTS of ELECTRICITY on HUMAN BODIES.
- IV. BOTANY, with some CHEMICAL ANALYSES.
- V. The ANALYSIS of the principal MINERAL WATERS of FRANCE.

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INTRODUCTION.

HIPPOCRATES uses the word *οικονομιν* to express the management of a sick person; by the animal-oeconomy therefore is meant the conduct of *Nature* in preserving animal bodies; a disease according to this notion is no more than the *derangement* of the animal oeconomy; whoever therefore is thoroughly well acquainted with the laws of the animal-oeconomy, he will best understand wherein this *derangement* consists, consequently be the fittest person to remedy it, or what is the same thing, to establish the practice of physic upon a sure foundation.

Sacred history informs us, that man, soon after his fall, experienced the sad effects of his disobedience after the judgment pronounc'd by his *Creator* *; for he became soon after subject to the vicissitudes of the seasons, the changes of heat and cold, or in other words, he became sickly, and that before he thought of providing either a dwelling-place or clothing for himself; he likewise soon observed, that his domestic-animals, as well as his flocks, like himself, were subject to distempers; this put him early under a necessity of seeking some means to remove both his own and their ailments; this was the first beginning of the *Healing-Art*.

* Cursed is the ground for thy sake: in sorrow shalt thou eat of it all the days of thy life. G. c. 3. v. 17.

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Such as discovered any thing, capable of relieving even the brute-animals, were then considered as benefactors to mankind, and very justly; for by preserving the proper sustenance of man, was deemed equal with that of preserving man himself.

As therefore the body of man is a most curious *machine*, composed of an infinity of branching and winding canals, filled with liquors of different densities and natures, but still governable by the laws of gravitation, action and re-action, it evidently follows, that all diseases affecting this *machine*, must arise from some irregularity in the motion, quantity and quality of those fluids, or from a bad conformation, texture and disposition of the canals they move through; now, as all those irregularities are only so many modifications of matter, it is evident they cannot so properly be examined into, or explained as by the known laws of mechanics.

The works of *Borelli*, *Bellini*, *Pitcairn*, *Cheney*, *Friend*, *Mead*, and in a more especial manner of *Boerhaave*, have evidently shewed what we might expect, had medical writers continued to treat medical subjects according to mechanical principles.

Borelli happily applied the doctrine of the mechanical powers to explain several parts of the animal-œconomy; *Bellini* has from the same principles, satisfactorily accounted for the unequal velocity of the blood

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in the arteries, according as these are situated further or nearer to the heart; by investigating the structure of the glands, he has unravelled the whole mystery of secretions, which is of the highest importance to the practice of physic, seeing there is no disorder, but requires for its cure, the increasing or diminishing some one secretion or other.

Pitcairn in like manner, has explained mechanically the structure of the lungs; unfolded the causes of the different passages of the blood thro' the heart of the *fœtus*; the necessity of his breathing after his birth; and why some vessels that were open before, are stopped after he has once breathed.

Friend has accounted mechanically for the periodical menstrual evacuations, and *Mead* has explained the effects different poisons have on the human body, upon the same principles.

Cheney, considering that continual fevers are only a complication of symptoms, which naturally follow, upon a general obstruction of the canals of a human body (or the glands which they constitute), and the necessary effects thereof, has set the doctrine of fevers in the most conspicuous light of any that wrote before him.

But it must be confessed *Boerhave*, of all the moderns, has rendered the most important service to the theory of physic; for by an uncommon sagacity, and an unparalleled industry,

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industry, he has penetrated deeper, into the hidden recesses of *Nature* than any of his cotemporaries, whereby he has reduced the study of physic into a concise and rational system; this indefatigable man, has from a variety of mechanical and anatomical experiments, together with a thorough knowledge of the doctrine of the ancient physicians, compiled the concise, and best system of physic that has hitherto appeared; a system intirely free from vain and delusory *hypotheses*, founded upon principles, demonstrable by the evidence of sense, which very probably will stand the *test* of succeeding ages, at least, while men will be guided by reason and sense.

In his excellent oration *de usu ratiocinii mechanici in medicina*, he has demonstrated the usefulness, nay even the necessity of the knowledge of mechanics, towards compleating a physician. How clearly has he laid down the laws of the animal-œconomy in his institutions, so necessary for every physician to know, if he ever expects to be successful in the cure of diseases? With what method, order, and perspicuity does he begin his admirable book of aphorisms? He there leads his reader, as by the hand, from the disorders of the simple fibre to the knowledge of the most abstruse and complicated disorders of the human body; and certainly whoever intends to attain to any considerable

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ble knowledge in any science, shou'd begin from the very elements of that science; it is with phisic as it is with astronomy; whoever purposes to make any progress in that noble science, must first begin with Geometry; even so a phisician, who expects to be successful in his practice, should first acquire a competent knowledge of the laws of the animal-œconomy, and as the greatest geometer is never deemed a skilful astronomer, till he becomes well acquainted with the motions, revolutions and retrogradations of the heavenly bodies, so a man, ever so well versed in the laws of the animal-œconomy, can never be counted a compleat phisician, 'till he has acquired exact histories of diseases, their different species, *Stadia's*, changes and revolutions, &c. For if we consider the human body as a *machine*, its disorders can be no other than some *derangement* in the motion of some of its springs and under-wheels; a phisician therefore ignorant of the animal-œconomy, is ignorant of the structure and movements of this *machine* he undertakes to regulate; such a phisician, let him be ever so well versed in the history of diseases, without a knowledge of the laws of the animal-œconomy, will never be able to form a right indication of cure, but may often find himself mistaking the ailment of one part for another, and so treating the sound part for a supposed distempered one. Both therefore

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fore shou'd go hand in hand; one without the other will never make a skilful or successful phisician; but when a phisician has united the knowledge of the laws of the animal-œconomy with exact histories of disorders, such a phisician will, with greater certainty, employ the most effectual means to repair the several breaches made in this *machine*, and regulate those springs and wheels that have been put out of order; such a phisician's practice must be as beneficial to others, as it will be honorable to himself.

The following papers do clearly shew, how useful the knowledge of the laws of the animal-œconomy, and histories of diseases are to a phisician, towards his forming a right notion of the event of disorders; they often set before his eyes the many resources *Nature*, when most oppressed, finds to relieve herself, and that often when it was least to be expected. Had therefore phisicians been as assiduous in collecting observations of particular morbid cases as the astronomers are, in recording the minutest aberrations of the heavenly bodies in their revolutions, &c. the *Healing-Art* might 'ere now, be upon as good a footing, as to rules and principles as any of the *sister sciences*, and be arrived at as great a certainty in its practice as the nature of the art, or the scanty measure of the human mind is capable of.

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MEDICAL ESSAYS
AND
OBSERVATIONS.

Animal Oeconomy.

*An inquiry how the circulation of the blood is
carried on in the fœtus. 1699.*

UPON the discovery of the circulation of the blood by the great *Harvey*, it was agreed by all anatomists, that the blood fell from the *vena cava* into the right auricle of the heart; that upon the contraction of this auricle, the blood was propelled into the right ventricle of the heart, and from thence into the *arteria pulmonalis*, and brought back by the *vena pulmonalis* to the left auricle and ventricle of the heart, from hence it was forced into the *aorta*, and all its several branches all over the body, and brought back to the heart by both *cava's*, *ascendens* and *descendens*, and so on while the animal lives; but as the *fœtus* does not breathe in the womb, his lungs of course cannot be dilated; little or no blood can traverse their substance in this their collapsed state, so *provident Nature* contrived a passage in the division of the two auricles, called *foramen ovale*, become famous on this account, thro'

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which

which a part of the blood brought to the *vena cava* passes from right to left: by this short passage the blood is as far advanced in its progressive motion as if it had passed thro' the substance of the lungs; but as the quantity of blood brought to the right auricle is still too great to be able to traverse the collapsed lungs, so the same *provident Nature* has contrived the *canalis arteriosus*, which conveys the most part of the blood, propelled into the *arteria pulmonalis*, into the *aorta descendens*, to be afterwards distributed all over the body. All anatomists since *Harvey's* time subscribed to this doctrine: no one ever objected to it till surgeon *Mery* did in the year 1695, as *Mr. du Hamel* has recorded it in his latin History of the Royal Academy: this year 1699, *M. du Verney* declared himself for the old doctrine: he further advanced that a *valve* found in the left auricle, easily permitted the passage of the blood from the right to the left auricle, but absolutely opposed its return from left to right; *Mery* in the first place flatly denied the very being of this *valve*, and 2dly, the use assigned it; and insisted the blood came from the left to the right auricle: for a confirmation of his opinion he said, that in the adult, both the auricles and ventricles of the heart, and both arteries *aorta* and *pulmonalis*, are pretty nearly of the same
dia-

diameters, because they contain nearly the same quantity of blood; whereas he always found it the reverse in the *fœtus*, viz. the *arteria pulmonalis* was near double the diameter of the *aorta*, consequently it contained near double the quantity of blood the *aorta* receives; for the *arteria pulmonalis* receives all the blood of both *cava's*, together with what comes from the left auricle, thro' the *foramen ovale*. For in Mery's opinion, the difficulty of the blood's traject thro' the lungs is in no wise the cause of this particular structure of the *foramen ovale*, but is rather owing to this, viz. as the blood in the *fœtus* contains no more air than what it receives from the mother by the *vena umbilicalis*, this air being in too small a quantity to help forward the blood, the heart on that account finds the more difficulty to propell this blood thro' the habit of the body; it was therefore necessary to lessen the quantity of the blood in the *aorta*, by returning a part of it to the right auricle by the *foramen ovale*. The stress of this whole dispute was thought to depend upon this matter of fact, viz. whether in reality the *arteria pulmonalis* is always larger than the *aorta* in the *fœtus*.

The academy therefore appointed some of its members to inquire into the truth of said fact; each party proved his, tho' opposite

assertion : Mery shewed the *arteria pulmonalis* larger than the *aorta* : M. Tawry, who had espoused his master *du Verney*'s opinion, shewed the same *arteria pulmonalis* less than the *aorta*. Tawry alledged further, that allowing the case was generally as Mery advanced, that the *arteria pulmonalis* was always larger than the *aorta* in the *fœtus*, yet it did not necessarily follow, that the *arteria pulmonalis* did receive double the quantity of blood the *aorta* received. The most that could be thence inferred was, that the blood circulated with more difficulty thro' the *arteria pulmonalis* in the *fœtus*, as the lungs are in him in a collapsed state ; for then the blood propelled into the *arteria pulmonalis* is obliged to fall back, and as the coats of this artery are not so strong as those of the *aorta*, they are therefore more easily distended ; and whenever the *aorta* is found larger than the *arteria pulmonalis*, as Tawry found it, it necessarily then follows, that the *aorta* received more blood than the *arteria pulmonalis* ; and here it can't be objected that the blood in the *aorta* is obliged to recoil or fall back ; for there is no impediment to its progressive motion, as in the other case, where the lungs are collapsed ; and 2dly, the coats of the *aorta* are much firmer than those of the *arteria pulmonalis* ; consequently are not so easily distended.

This

This affair lay over till the year 1701, when M. *Littre* opened a man about 40 years old, in whom the *foramen ovale* was still open : besides, the auricles and ventricles of the heart and its arteries were as *Mery* advanced, larger on the right than on the left side. In this case, more blood certainly was contained in the larger vessels ; lastly, the very shape of the *foramen ovale* was a strong presumption, that the blood came from the left to the right ; this *foramen* was like a tundish, whose larger end was in the left auricle. M. *Littre* further added, that he had observed nearly the same thing in another man, of much the same age. This observation seemed to support for some time *Mery's* opinion, 'till M. *Chemineau* in the year 1703, produced the heart of a *fætus* of a most extraordinary structure : it had three cavities, like the heart of a *tortoise* ; these cavities communicated with each other ; the right ventricle received the *cava* as usual, but not the *arteria pulmonalis* ; the left ventricle received the *vena pulmonalis*, but not the *aorta* ; the third ventricle received both arteries *pulmonalis* and *aorta*, their orifices were so disposed, that the blood propelled from the right ventricle into the middle or third ventricle naturally followed the direction of the *arteria pulmonalis*, as did the blood from the left ventricle follow the direction

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rection of the *aorta*; the *arteria pulmonalis* was here twice less than the *aorta*, nor was there any *canal of communication*. Here *Mery*'s opinion seemed totally overthrown; but *Mery* replied, that as this was a preternatural case, it could not be drawn into a consequence:—the abettors of the old system here added, that those appearances *Mery* laid so great a stress on, (*the larger capacity of the vessels on the right side*) were always the reverse in the brute *fœtus*'s, in the calf and lamb especially. *Mery* allowed the fact, and in them granted the circulation might be carried on according to the old system, but insisted it was always the reverse in the human *fœtus*, the circulation was therefore different in him. This dispute from this time 1703, lay silent, seemingly in a vanquished state, all the anatomists in *Europe* to a man subscribing to the old *Harvean system*; for *Mery* stood alone, no other abetting his opinion, but his pupil *M. Rouhaut* a surgeon, who about this time was called to *Turin* by the King of *Sardinia* to be professor *regius* of anatomy in the new university lately founded there. In the year 1717, *M. Winslow* steps forth as a moderator between both parties; he tells us, he had long sought for a valve, *Eustachius* said was at the orifice of the *cava ascendens*, but to little purpose; because he always opened the
cava

cava anteriorly, and by that means he always destroyed this *valve*.

But happening to open the *cava* posteriorly, he found this *valve*, as *Eustachius* described it, of a semi-circular figure, concave above and convex below; he further observed, that this *valve* is by far more visible in the *fœtus* than in the *adult*, in whom it is effaced in proportion as the *foramen ovale* is closed up: from this observation, M. *Winslow* began to consider, that as *Eustachius's* *valve* diminishes and is entirely effaced in the *adult*, that it must be of more use to the *fœtus*, and must therefore contribute more to carry on the circulation of the blood in him, which it must be confessed is still very extraordinary. M. *Winslow* further observed, that the floating membrane in the left auricle, called a *valve*, cou'd not prevent the blood's passing from left to right, as was asserted; and that the most it could do was to shut up the *foramen ovale* after the birth of the *fœtus*; but that before the birth, the blood of both auricles cou'd and did mix with each other.

Upon the whole then, he observes 1°. that both parties agree, that the *fœtus* while in the womb does not breathe, consequently that during this time his lungs are not dilated. 2°. Both likewise admit of the necessity of the *canalis arteriosus*, to abridge

the circulation of the blood : for the blood in this collapsed state of the lungs, can receive no air but from the mother. M. *Winslow* herein agrees with *Mery*, that it is for want of air in the blood of the *fœtus* that this peculiar structure of the *foramen ovale* became necessary. 3°. Both parties admit, that a part of the blood passes from one auricle to the other thro' the *foramen ovale*, with this difference, that one party asserts it comes from right to left, the other from left to right. Now, M. *Winslow* thinks that the *canalis arteriosus* wou'd sufficiently answer all the abettors of the old opinion required, without supposing that any part of the blood did pass from the right to the left, thro' the *foramen ovale* ; as the *canalis arteriosus* wou'd sufficiently abridge the circulation, by taking off so much of the blood as cou'd not now traverse the lungs ; on the other hand, the *foramen ovale* alone wou'd fully suffice to abridge the circulation in the new opinion, not thro' the lungs indeed, for here one third of the blood at least is supposed to circulate thro' them, but thro' the whole body : for *Mery* insists, that all the blood in the *fœtus* would never be able to circulate thro' the whole body, for want of a sufficient quantity of air, which in the collapsed state the lungs are now in it cannot receive. It is for this reason that *Mery* wou'd

wou'd have so much of the blood to return to the right auricle by the *foramen ovale*, as wou'd be too hard for the left ventricle of the heart to carry about for want of this necessary quantity of air.

And here M. *Winslow* adds, that upon a closer inquiry he thinks that both parties lay too great a stress upon some things; the old opinion on the *valve* in the left auricle, the new one upon the larger diameters of the vessels on the right side; whereas by the strictest inquiry he was able to make, he cou'd not perceive in the first place, that the membrane in the left auricle, cou'd ever perform the office of a *valve*; on the contrary, that it equally permitted the blood to pass from left to right, as from right to left: his prejudice in favor of a *valve* being removed, he began to reflect, that as the lungs in the *fœtus* have no function, *i. e.* are not dilated so as to be able to mix and assimilate the blood; and as this mixture must be performed some where; he imagines it is done in the auricles, as the blood in their *diastole* passes equally from one to the other; in their *systole* this blood is after propelled into their respective ventricles, and by these into their corresponding arteries, to be thence distributed all over the body, in proportion to the diameters of the said vessels in each part. Thus M. *Winslow* wou'd

wou'd have both parties reconciled ; to lay aside the notion of a *valve* on the one part, and the *ratio* of the larger diameters of vessels, the greater force and resistance on the other part ; since his solution of the matter answers all difficulties, and reconciles the experiments made by both parties ; and lastly, since it so well chimes with the opinion of the academy in 1703, which seemed to think, *that it was not impossible for both opinions to be true in some circumstances.*

However, *Mery* was in no wise pleased with this expedient of reconciling matters, so the whole dispute remained almost forgot by all parties, till the year 1739, when *M. Lemery*, by one single reflection, and what is very extraordinary that it never occurred to the great men for the old opinion, buried for ever *Mery's* opinion in oblivion. The blood, says *Lemery*, on its first formation, comes from the *placenta*, by the *vena umbilicalis* to the right auricle of the heart : in this first period of time, it necessarily passes from the right to the left auricle by the *foramen ovale*, as meeting there with less resistance. Now, as there can no reason be assigned, why the blood shou'd ever after change its route, or return from left to right, as *Mery* fancied, so the old opinion about the circulation of the blood

in

from the ROYAL ACADEMY. II
in the *fœtus*, is right and must ever remain
triumphant.

Sudden effect from a clyster, 1700.

M. Homberg reported to the academy that a young woman after taking a clyster, wherein was *camphire* and brandy, perceived in an instant the brandy in her mouth; she became dead drunk, but never returned the clyster: she however made plenty of urine, which she cou'd not for some time before so easily do.

An inquiry into the structure and use of the marrow, 1700.

There is no part in an animal body but has its peculiar structure and use; the marrow at first sight seems to be only an irregular substance; but upon closer inquiry, it is found to consist of an infinite number of little cells, opening one into another, and filled with a fine oleaginous substance, extracted from the blood: these little cells are wrapped up and supported by a fine membrane, that lines the cavity of such bones as contain marrow; both *Hippocrates* and *Galen* believed the marrow was intended to nourish the bones; for say they there are no blood-vessels found in the bones, and those observed to traverse their substance are known to discharge their contents into
their

their cavities, where it is converted into marrow, their proper nourishment: besides, all the long bones destined for the greatest action, have also the largest cavities, and those always filled with marrow, laid up no doubt for their nourishment.

M. *du Verney* the elder, replies, 1°. that he always found the bones of all young animals full of blood-vessels. 2°. That there are many bones which are intirely solid, as the *ossicula* of the ear, harts horns, which are nevertheless nourished. 3°. That there are many bones with cavities, which contain no marrow, as the frontal and other *sinus*'s, which are only lined with a membrane; lobster's claws are hollow, tho' they contain no marrow; but why the long bones have cavities, is not only to contain marrow, but rather to render such bones of less weight to the animal, while they still retain their full strength and firmness; but the most rational use of this marrow, laid up in the cavities of such bones, is to preserve the soupleness of the bony fibres, and by that means render them less liable to be fractured, in the various and some times violent motions the animal is often obliged to make*.

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* M. *Lemery* the son, in a treatise on the nourishment of the bones published in 1704, confirms M. *du Verney*'s opinion, that
it

From a number of experiments M. du Verney made, he is convinced that the marrow transpires and penetrates the substance of the bones, not only during the life of the animal, but also after his death; his *skeletons* which were at first all white, turned yellow after, which must be owing to the marrow's penetrating their substance.

That the marrow is the true seat or organ of sensation in all animals, the same M. du Verney has clearly demonstrated: for as often as he touched the marrow, after the amputation of the limb, he always observed that the patient complained of pain; this he proved before the academy, where he cut off the thigh bone of a large mastiff dog; as often as he plunged a *probe* into the marrow, the

it is not the marrow, but a particular nutritious juice, brought to the bones by the lymphatic arteries that nourishes them: to evince this, he boiled in water some bones with their marrow; he found two kinds of substances in the water, an oyl which floated on the top, but congealed when cold: the other substance was like gelly, both in taste and consistence. M. Lemery infers from this, that the oyl found floating on the top of the water, is the marrow, destined by *nature* to preserve the suppleness of the bony fibres; the other substance is the nutritious juice, which like all other animal juices, turns by boiling into gelly: but what puts this matter out of all dispute, this oyl is found in such bones only, as contain marrow; whereas the gelly may be extracted from all kinds of bones; and as marrow is to be found in such bones only, as are exposed or obliged to perform violent motion, even as we find, that such muscles as are obliged to sustain the greatest efforts, are more provided with *axungia* or fat; so it is very probable that the marrow and fat are laid up in those places to preserve the suppleness of both the bony and fleshy fibres, for the greater safety and well being of the animal.

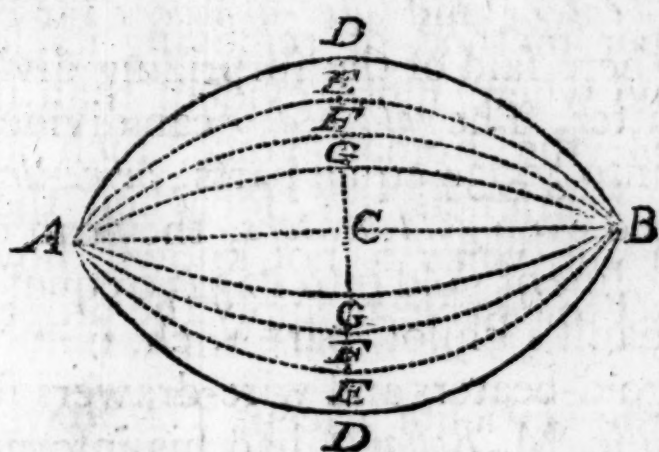
the dog by his howling, gave visible signs of the exquisite sense of feeling in the marrow.

An inquiry into the true organ and formation of the human voice. 1700.

An exact knowledge of the structure and use of any part, points out more effectually the proper method of removing its lesion: this is no where more evident than in the lesions of the human voice, such as extinction, hoarseness, &c. for when the true organ of the voice is not known, how can we expect to be able to apply the proper medicines?

All the antients except *Galen* were of opinion, that the *trachæa* was the organ of speech: they accordingly directed all their views to that part in the several lesions of the voice. All authors and anatomists since *Galen's* time are silent about the matter. *Perault* in his *Essais de Physique*, was the first, who asserted that the *glottis* was the sole organ of speech. *M. Dodart* enters into all the divisions and sub-divisions of tones the human voice is capable of; and after a masterly manner has calculated the various and surprizing combinations of sounds, in which harmony consists: he has demonstrated, that the *trachæa*, mouth, tongue and nose have no other share in the formation of the human voice,

voice, but what little it receives by reflection, in rendering it perhaps more agreeable; and that the difference of sounds, such as *acute* or *grave*, &c. intirely depend on a greater or lesser contraction of the muscles of the *glottis*. This figure with its explication may help to convey his thoughts on this matter.



Let us suppose that this figure A D, B D be the *glottis*, opened as wide as is necessary to form the gravest tone; 2° . That this *glottis* doth contract itself, forming the circle or arc A E B, in order to form a more acute tone and so on, successively contracting itself, to form still more and more acute tones, till it comes to form the acutest of all in A C B.

The surprizing divisions and sub-divisions the human voice is capable of, may be rendered somewhat familiar to us, by considering the surprizing, and almost incredible divisibility of matter. Mathematical instrument-

ment-makers divide an inch into 400 equal parts, each part still visible to the naked eye; a line, which is but the $\frac{1}{12}$ of an inch, might therefore be divided into $32\frac{2}{3}$ actually visible parts; each of these 32 parts may by the help of a *microscope*, be seen to contain 300 distinct parts, which multiplied by 32, will give 9600 distinct parts in a line, the $\frac{1}{12}$ of an inch.

Gold-beaters and *wire-drawers* far exceed what is here said of the surprizing divisibility of matter. The *gold-beater* can divide a line of gold into 30034 equal parts; *wire-drawers* far exceed even *gold-beaters*, they can divide the same line of gold into 123270 equal parts. See Rohault's Philos. part 1. ch. 9.

Our gold-beaters and wire-drawers far exceed those M. Rohault had his information from. M. Reaumur, found that one grain of gold in our common gold leaf was extended unto 36 and a half square inches; that an ounce of gold is beat under the hammer into 146 and a half square feet, an extent almost double to what gold-beaters cou'd do in Rohault's time. It was then deemed prodigious that an ounce of gold might form 1600 leaves, which together only made a surface of 105 square feet.

How considerable soever this extension of gold under the hammer be, it's nothing to that it undergoes in the *drawing-iron*; there are gold leaves that are scarce one 30000th part
of

of an inch thick, and yet this is a notable thickness in comparison of that of the gold, spun on silk in our gold thread.

M. *Reaumur* by exact weighing and rigorous calculations found, that one ounce of this thread was 3232 feet long; but in *Rohault's* time it was made but 1200 feet. M. *Reaumur* computing what the thickness of this gold must be where thinnest, finds it only one 3150000th part of an inch, and yet this is not the utmost ductility of gold; for instead of two ounces of gold to an ingot of silver of 30lb, some employ but one ounce, and then the thickness of the gold in the thinnest places wou'd only be one 6300000th part of an inch; and yet as thin as the plates are, they may be made twice as thin, and still be gilt, by only pressing them more between the *Flatter's wheel*; they here are extended to double the breadth and proportionably in length, so that their thickness at last will be reduced to one 13 or 14 millionth part of an inch.

Yet with all this amazing thinness of the gold, it is still a perfect cover for the silver; the best eye, or even the best microscope cannot discover the least chasm, and shou'd a piece of this gold thread be laid to dissolve in *aqua fortis*, the silver will all be excavated, or eat out, and the gold left intire in little tubules. *Memoir de l'acad.* 1713.

Sound is known to make 180 fathoms in a
Vol. III. C second,

second, consequently 283 leagues in an hour, provided there be no impediment in the way, and yet light is known to transmit itself 600,000 times faster than sound; so surprising is the divisibility of matter.

M. Ferrein in 1741 takes a review of this same subject; he confesses that all the ancients, as well philosophers, as anatomists, considered the organ of the human voice as a kind of a flute, or rather, as the pipe of an organ. The *larinx* as the principal part, the air the efficient cause, the *trachæa* the *port-vent*, and the lungs the bellows; lastly, the contraction of the *thorax*, the weight that naturally depresses the said bellows, the lungs. He also confesses, that all kinds of instruments may be reduced to two sorts; the first are such, whose properties depend both on their construction, and the matter they are made of; such are all kinds of bells, sonorous strings, &c. The others derive their properties from their construction only; such are all flutes, flageletts, organ pipes. The first kind of instruments become sonorous only by sensible vibrations, excited in the *medium* or atmosphere they are placed in; and as soon as those vibrations cease, they also cease to be sonorous. The sound likewise varies, according to the nature of the matter, such instruments are made of; it is the reverse in all wind instruments: let them be made of what substance or
matter

matter they may, there is no difference perceivable in the sounds they produce. M. *Ferrein* further confesses, that at the upper end of the *larinx* there is a *cleft*, from 8 to 10 lines long, and a line at most wide, which is universally known by the name of *glottis*, thro' which all the air we inspire is returned; the rim or border of this *cleft* is known by the name of the *labia glottidis*.

All this *apparatus* has been compared with the mouth of our flutes, or rather with that of an organ pipe, capable only of contracting the passage of the air, in some measure as the cleft of a rock, thro' which the air in a kind of a whistling noise traverses; the human voice was hitherto judged to proceed from the collision of the air, expelled with force out of the lungs, or otherwise modified by the impediment it met with in its passage. *Aristotle*, *Galen*, *Bæcius*, *Perault*, and *Dodart* were of opinion, that all acute sounds depended on the contraction of the *labia glottidis*, and the swiftness of the air passing under them, occasioned by the said contraction. M. *Ferrein* confesses, that this opinion has the suffrages of both the ancients and moderns for 2000 years and upwards; he however apprehends, that the several variations of the human voice do not, in any wise depend upon the contraction of the *labia glottidis*, and swiftness or celerity of the air passing under them :

them : On the contrary, he has demonstrated that the clearness and fulness of the voice increases considerably, upon the contraction of the *glottis*, and was as considerably diminished by its becoming wide. To be convinced of this matter, he took the *larynx* of both a man and a dog, and having fixed his blow-pipe in the *trachæa*, and gradually blowing into it, pressing at the same time on the *glottis*, and exactly observing all the degrees of pressure possible, the strength of the sound constantly varied, tho' the tone itself did not vary in the least : from this experiment it is evident, that the contraction of the *glottis* and swiftness of the air can never make the least alteration in the tone of the voice, without at the same time considerably increasing the strength of the sound itself.

These experiments induced M. Ferrein to look upon the organ of the human voice as an instrument partly vocal, and partly instrumental, but more instrumental, acted upon by two sonorous strings (the two muscles of the *labia glottidis*) ; the air coming out of the lungs he imagines acts upon these strings, somewhat like a bow on the strings of a fiddle ; to confirm this, he took the *trachæa* of an animal, and having dissected those muscles, he blew with a blow-pipe into the end of the *larynx* next the lungs, holding at the same time those muscles, and by contracting them
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more or less, he could perfectly imitate the human voice in all its variations, as to grave and acute tones, or those in a *medium* between both: he likewise cou'd imitate the barking of a dog, the bellowing of the bull, the grunting of a hog, and many other such sounds. These experiments he often verified in the presence of his pupils, and before the academy; and from them concludes, that the above two fine muscles of the *labia glottidis* are the organ of the human voice.

An inquiry, what becomes of the air we constantly inspire, 1700.

All anatomists agree that the blood every instant of life circulates thro' the lungs, and that the air we constantly inspire, by expanding the bronchial vesicles contributes greatly towards its traject thro' them, but are not agreed as to the manner how this is done. Some imagine that the air by its pressure only on the blood-vessels, helps forward the blood, without ever entering the coats of those vessels, or otherwise mixing with the blood in the lungs; others believe that the air penetrates the vessels in the lungs, and by its action on the blood shoves it forward; but none hitherto has inquired, what becomes of this air, after it mixes with the blood in the lungs; whether it exhales with the *perspirable matter*, or returns with the blood, to be expelled the same

same way it entered, by the *trachæa*.

As it is certain that more matter is discharged by the skin than by all other outlets of the body taken together, so it should seem very probable, that this air doth in like manner constantly exhale with the same *perspirable matter*. M. Mery is of the contrary opinion; he conjectures that the air which enters the *pulmonary vein*, is carried thence to the left ventricle of the heart, and propelled after with the blood into the *aorta*, to make the same rounds with the blood, and is brought back with the same blood to the right ventricle of the heart, and from thence propelled into the *arteria pulmonalis*, and is at last expelled by the same passage it entered, by the *trachæa*. What seems to countenance this conjecture is, 1°. That all animals put under the glass-bell of an air-pump do swell, whereas did the air exhale with the *perspirable matter*, they should not. 2°. When air is blown into the *trachæa*, the left and not the right ventricle of the heart is observed to swell. 3°. When air is blown into the *arteria pulmonalis*, it is observed to escape by the *trachæa*, and none of it is taken up by the corresponding vein. These experiments seem evidently to prove, that the air we inspire enters by the veins, and returns by the arteries of the lungs, and does not exhale with the *perspirable matter*. Further, the use here assigned

assigned this air, constantly circulating with the blood, seems to corroborate this conjecture. As the veins receive as much blood upon each contraction of the heart as this throws into the *aorta*, so there is as great a force required to bring back this returning blood, as was necessary to propell it thro' the *aorta*; now, as the veins have scarce any elasticity, they necessarily require some assistance to help forward the returning blood. The air we constantly inspire, and which is the only elastic body we know, constantly supplies this assistance to the veins; this air acts upon the returning capillary veins as a counterpring, to press forward the returning blood, which it cou'd not do, did it constantly exhale with the *perspirable matter*, as some *phisiologists* have imagined: but after this air has performed its circuit, it becomes then effete, loses its spring, and is therefore expelled by the *trachæa*, to make room for a new supply, and for the same purposes, and so on while the animal lives.

To this was objected, that upon collecting a sufficient quantity of the *sudor humanus*, and putting it under the bell of an air pump, it is observed to contain as much air as any other fluid; consequently the air we inspire constantly goes off with the *perspirable matter*.

M. Mery admits that air constantly exhales thro' all the several outlets of the body
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along with the *excrementitious juices* thereof; but insists it is not the air we constantly inspire, but that air only, which we daily take in with our food, and which is intimately blended with the chyle, so as to make with it but one and the same fluid; whereas the air we every instant suck into our lungs remains in substance, never blends with, nor never can be intimately mixed with the blood, and the several juices derived from it, which shou'd be well considered. And it is upon that very account (its not mixing with the blood,) that this air is of so very great use in the *animal æconomy*; for by preserving its springiness, it shoves on the returning blood, by imparting to the capillary returning veins that springiness they want, as was before observed; whereas, did it constantly exhale by the *vasa exhalentia*, along with the *excrementitious juices*, it cou'd not perform those salutary effects; and the less so, were it intimately mixed with the blood; for it is a known fact, that air mixed with water for example, is dissolved, becomes the same fluid with it, of course loses its property.*

A proof of this we every day see in *cas-cades*, water spouts, &c. where the air suddenly let in, raises the water by its pressure on it, whereas the air intimately blended with the same water has no such effect.

It is also as certain, that we every instant
 * *Mariotte.* of

of our lives expire nearly as much air as we inspire, which never cou'd be the case, did this same air constantly exhale thro' the several outlets of the body; all which when duly considered, will help to evince the truth of this assertion, viz. that the air we constantly inspire, follows the course of the blood, and is discharged after by the *trachæa*.

That the air we constantly inspire, can never intimately mix with the blood, will be the more readily conceived, by considering the following fact.—All fluids are known to dissolve but a certain determinate quantity of such bodies, as are exposed to their action: water for example, will dissolve but a certain quantity of salt, and if more salt is added than the quantity of water employed can dissolve, this superadded salt will remain undissolved, in the bottom of the vessel; why may not some such like thing happen in the human body? the chyle in all animals contains as much air as it can dissolve; this chyle carried daily to the blood, supplies it constantly and all the juices separated from it with as much air as they are capable of dissolving, or receiving between their interstices, while the air we constantly inspire, remains undissolved in substance, as the superabundant quantity of salt remained undissolved in the water: this air thus undissolved, never mixing with the blood, but pre-

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serving its natural springiness, is continually making efforts to be set at liberty, and upon that very account, contributes greatly to bring back the returning blood, in order at last to free itself from its confinement, by those outlets which are the only ones capable of giving it issue, the capillary arteries of the *arteria pulmonalis*, and which permit nothing else to pass thro' them, at least while they preserve their natural tone and springiness.

The following experiments seem to support this assertion. When milk and water are injected into the *arteria pulmonalis*, the corresponding capillary veins take it up; the air intimately mixed with them, following the same course. But when air alone is blown into the same artery, the air is observed to go intirely off by the *trachæa*; none of it is seen to be taken up by the corresponding veins, as they were observed to take up the milk and water, which seems to prove, that it is not the air intimately mix'd with our food, that exhales thro' the vessels of the lungs, and goes off by the *trachæa*: further, when air is blown into the *trachæa*, this is carried intirely by the veins to the left ventricle of the heart, and not one *atom* enters the arteries; from these experiments it naturally follows, that as the pulmonary artery refuses to admit the air blown into the *trachæa*,

chæa, but permits it to exhale thro' it, when first blown into the pulmonary artery, so this artery must necessarily be the only outlet appointed by nature for its discharge.

Lastly, when the *vena cava ascendens* of a live dog is opened a little above the emulgent artery, it is always observed, that in proportion as the blood runs out, the *cava* fills with air, which is carried to the right ventricle of the heart : in this case, it is evident that this air could come no other way but by the capillary veins, that brought back the returning blood ; and it is as evident that this same air was never intimately mixed with the blood, but always remained undissolved in substance, following constantly the course of the blood, till it was at last discharged by the *trachæa* ; otherwise in the above case, it would escape with the blood thro' the opened vein, and never pursue its course to the right ventricle of the heart, as in the above experiment it is known to do.

M. *Bouillet*, secretary to the academy of *Beziars*, examines a new this same subject ; he confesses he was formerly of the same opinion with Messrs. *Pitcairn* and *Boerhaave*, that no air cou'd pass to the blood, either thro' the internal surface of the bronchial tubes, or thro' the exterior surface of the body, but upon considering the experiments of Messrs. *Reaumur*, *Petit*, *Hales*, he imagined

that air dissolved in any liquid, might penetrate the vessels of the lungs, when it had been imbibed by the *serum*, that is always found there to lubricate the membranes of the bronchial tubes. In this case, he thinks the air thus imbibed, *i. e.* dissolved by the *serum*, might be taken in by the absorbent vessels, and so be carried to the blood: the experiments of *Sylvius*, *Swammerdam*, *Thruston*, and verified by *Bergerus* evince as much; they took warm water, which they had colored, the better to demonstrate the thing; they poured this water into the *trachæa* of a dog, often repeating the same, but without using any force, or compressing the lungs; yet it penetrated the membranes of the bronchial tubes, and was seen taken up by the pulmonary veins; the air in like manner, when imbibed by the *serum*, might and does constantly penetrate the same membranes, and is taken up by the same veins.

All the absorbent cutaneous vessels do in like manner admit air; the whole body is pervious: baths and unctions do demonstrate it. Air therefore constantly exhales thro', and is as constantly admitted into all parts of an animal body. *Hippocrates* was sensible of this fact, when he asserted, that the body like the lungs, did perpetually admit and exhale air; *M. Keil* has since confirmed the same thing.

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The use of this constant supply of air in M. Bouillet's opinion is, to preserve the fluidity of the blood and its several juices; to keep up the tone and springiness of the vessels; the known effects of the air on our bodies he thinks confirms this conjecture; for when the air we breathe is either too hot, or too cold, the blood and other humors circulating with it are sensibly affected thereby; when this same air loses its spring, as at the approach of rain, &c. our blood and the several humors mixed with it, for want of a due pressure on our vessels, run into cohesions, thereby forming obstructions in the capillary arteries, the source of most of our chronic disorders; lastly, whenever this same air is loaded with deleterious particles, it soon induces such changes and alterations in our blood and humors as to produce the worst of disorders, the *plague* itself, as daily experience evinces: all this but too evidently proves to us, that the air constantly pervades both the lungs and exterior surface of the body.

An inquiry how far the stomach is concerned in the action of vomiting. 1700.

M. Chirac was the first who advanced that the *diaphragm* and *abdominal* muscles were the sole agents in the action of vomiting, and that the contraction of the fibres of the stomach

stomach had no part in it, as was hitherto universally believed. M. *du Verney* the elder, who had given vomits to several animals, in order to ascertain the truth of this fact, repeated the same experiments before the academy; but as these experiments did not sufficiently clear up this affair, so for want of more leisure time, the affair was referred to what further experiments M. *du Verney* shou'd at a more convenient time make.

M. *Littre* among others objected, that some vomit so easily as scarce to be observed to make any efforts at all. 2°. That all animals that chew the cud, are known easily to bring back their food into their mouth. 3°. That many are known to throw up clysters by the mouth, which in a great part of their passage were out of the power or any influence of the pressure of the *diaphragm*, and abdominal muscles; and lastly, as the *æso-phagus*, stomach and intestines are one continued canal, and as these have naturally a *peristaltic motion*, capable of expelling their contents, so 'tis more than probable, that they have also their *antiperistaltic motion*; consequently, as the stomach and *æso-phagus* are a continuation of the intestines, they have also their motion or contraction.

Examples of some sudden deaths. 1701.

A young lad about 16 years old, began to
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waste in his flesh since he was 14; he had also a cough, difficulty of breathing, and upon the least violent exercise, or passion, wou'd faint away: he happened one evening to be very angry with one of his companions, and having supped more plentifully that night than usual, he went to bed by ten, slept quietly till two: he then awoke with a violent fit of coughing, which was soon followed by a violent *hemorrhage*, which carried him off by five in the morning. M. *Littre* who opened him, found a good deal of froathy blood in both the *trachæa* and *bronchia*, in both *cava's*, in the right ventricle of the heart, and in the *arteria pulmonalis*: this blood was coagulated, and yet there was not one drop of blood in the left ventricle: the pulmonary vein was greatly distended, and near as big as the heart, and contained a fleshy con- crescence, two inches thick; the under por- tion of the left auricle was thicker than usu- al; it was besides ossified, and narrower than the upper portion of the same. This preternatural conformation of this auricle is what intercepted the circulation of the blood thro' the pulmonary vein; the *polypus* in like manner contributed to intercept the course of the blood and to distend the auricle, as was before observed.

Now, as the blood cou'd no longer pass thro' the trunk of the pulmonary vein, it ne- cessarily

cessarily must stagnate in the capillary arteries of the *arteria pulmonalis*; these of course must soon be distended, and at last ruptured; whence the above froathy blood found in the *trachea* and lungs. The *serum* by stagnating became acrid, and falling on the *bronchia*, excited that troublesome cough, and difficulty of breathing; the effect any violent exercise, or passion had on the patient was to rarefy the blood in the lungs: its return to the left ventricle was the easier intercepted; the *aorta* by this means, being deprived of blood, the brain must of course be deprived for a time given of its due quantity of blood; little or no secretion of spirits cou'd then be made: in such a case, the patient must necessarily faint, and die at last, when no blood at all could pass to the left ventricle. The extraordinary meal the patient had taken the night before, distended greatly the stomach, and forced up the *diaphragm*, so as to contract the cavity of the *thorax*, and of course compress the lungs, which contributed very much to the bursting of some of the vessels.

A woman died suddenly in the street. ibid.

M. *Littre* opened this woman; he found the left ventricle of the heart greatly inflamed, and by that means become 8 lines thick, while the right was but one line thick; the cavity of the left ventricle was of course greatly

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ly diminished, and what is more, it had not one drop of blood in it. The *aorta* was ossified in many places; its interior coats were full of small fungous ulcers, tho' without any inflammation; the *sigmoidal valves* were both hard and callous; the *vena cava*, right auricle and ventricle were full of black, coagulated blood; the lungs in like manner were distended with blood; but it was less black and more liquid. The inflammation of the left ventricle undoubtedly proceeded from an obstruction in the coronary arteries; the blood not been taken up by the coronary veins, soon distended the above arteries, whence the extraordinary thickness of the left ventricle. The ossification, and waste of the muscular coats of the *aorta* so weaken'd its *systole*, that it cou'd not propell the blood to the brain, and the other parts; in such a case, there cou'd be no secretion of the vital fluid; of course no influx of the same into the heart. This necessarily became paralytic; death must unavoidably ensue.

Sudden death owing to one of the sigmoidal valves. 1713.

To carry on the circulation of the blood, it is not sufficient that the heart propells the blood into the arteries, but these must likewise contract themselves, to push forward the blood they received; and as the arteries are

elastic tubes, whose contractile power is from their circumference to their axis, so they propel the contained fluid equally to both extremities; wherefore if *Provident Nature* had not placed some impediment, what anatomists call valves from their office, something like folding doors, at the orifice of each ventricle of the heart, the blood propelled by the heart into those arteries, wou'd upon their lateral contraction, fall back into the ventricles of the heart, which must soon put an end to its circulation.

This was exactly the case of a woman who died suddenly, and whom M. *Littre* opened; one of the *sigmoidal valves* was fastened to the trunk of the *aorta*, which prevented its receiving any more blood, the left ventricle of the heart continually receiving blood, and not able to discharge any of it, was at last overpowered; its action must cease of course, death in such a case must inevitably ensue.

Another died suddenly upon taking a dose of physic. 1701.

M. *Littre* opened this man also, who was 50 years old; he complained before he took this physic of a weight on his chest, and of a difficulty of breathing, and used sometimes to spit a little blood. He did not appear to have any pressing occasion for the physic, and yet he died $\frac{3}{4}$ hour after, greatly oppressed, and
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in violent convulsions, endeavouring to no purpose to vomit.

Upon opening him, the left ventricle of the heart was twice thicker than usual; the *sigmoidal valves*, were cartilaginous, and when shut, were above two lines asunder; the *aorta* was double its natural capacity, and its coats were considerably thinner. Its interior surface was ulcered in many places, and these ulcers had consumed near half the substance of its coats: there were besides many ossified points, some as large as the nail of one's thumb, while its several branches were both found and of their natural thickness. In each cavity of the *thorax* were found six ounces of a redish *serum*; the lungs were both big and heavy, and the blood in them was fluid: the glands of the lungs, the *bronchia* and some of their vesicles, were, in the place of air, so full of the same serum, that M. *Littre* cou'd hardly dilate them, even by blowing into them with a bellows; the *pericardium* and cavity of the *hypogastrium* contained a good deal of the same kind of *serum*; the cartilages of the *larinx* were ossified; the *glottis* on account of this ossification, was greatly contracted; the two large branches of the *bronchia* in the left side were lightly excoriated, from whence probably the little blood the patient used to spit up came.

M. *Littre* attributes the cause of this man's

death to the thinness of the coats of the *aorta*, while those of its branches remained stronger, opposing of course too great a resistance to the *aorta*; for to carry on the circulation of the blood, there shou'd be a due proportion in point of strength between the contractile force of the *aorta* and its several branches taken together; for, as it is the contractile force of the *aorta* and its branches that pushes forward the blood, propelled by the heart into the *aorta*, this force is necessarily as the solidity (thickness) of the muscular coats of the *aorta*; but as the coats of the *aorta* were here so thin, their contractile force was not able to distend its branches; this is what occasioned this great dilatation of the *aorta*.

The ossification of the *sigmoidal valves*, contributed a good deal to the dilatation of the trunks of both the *aorta's*; for these *valves* being ossified cou'd not sufficiently close themselves so as to prevent the return of a part of the blood into the left ventricle; the heart being constantly obliged to propell this overplus of blood into those trunks, their coats were necessarily distended, of course became thinner.

Another killed himself in an instant, by running his head with all his might against a wall. 1705.

This man lay under sentence of death, and was to be broak on the wheel, to avoid which,
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he ran with all his force against the wall of the dungeon he was in, with both his hands behind his back, and his head hanging down. He instantly fell down dead, without even a groan, or speaking one word, as his fellow-criminals assured M. *Littre*, who was called upon to open him. M. *Littre* was greatly surprized to find neither tumor nor contusion on the exterior parts, nor fracture in the *cranium*, upon cutting the integuments, and was no less surprized to find every thing in its natural state. The *cerebrum*, *cerebellum* and *medulla oblongata* were all found, and both to the view and touch much more firm and compact than usual, nor did they fill the *cranium*, as they always do. M. *Littre* conjectures that this man's death was owing to the sudden collapsion of the brain, by which means the influx of the animal spirits into the heart and lungs was suddenly intercepted; the brain thus suddenly collapsed, and not being elastic, cou'd not restore itself; death must necessarily ensue.

Why no tumor or contusion appeared exteriorly was owing to the sudden collapsion of the vessels of the brain, which suddenly stopp'd the circulation of the blood in all parts. A tumor after a contusion proceeds from the blood extravasated in the contused parts, but as the blood suddenly ceased circulating in the case before us, the instant the
vessels

vessels in the integuments were contused, there cou'd be no extravasation, of course no tumor.

Sudden death from confined putrid air. 1745.

M. Dupuy physician at Rochefort writes to M. du Hamel, that upon discharging the crew of one of the king's ships, after its return from Cadiz, one of the sailors happened to knock out the bung of a hoghead, that had sea-water in it, which had been imprudently bunged down; and that he was struck dead in an instant. That six more, who were in the hold with him, but at some distance from the hoghead, were likewise knocked down, left senseless with some convulsive motions. The surgeon upon hearing of the accident, ran to their assistance; but he no sooner entered the hold of the ship than he shared the same fate of the rest. But as soon as they were dragged out of the hold into the open air, they all to the first, recovered. The body of the first sailor was swelled prodigiously, and black blood came from his mouth, nose, and ears. But as he was already become so rotten, it was not possible to open him.

Of the formation of the human fœtus. 1701.

The system of the generation of all viviparous animals from eggs, contained in the
ovaria

ovaria of all viviparous females, is now generally received by most anatomists ; for exclusive of the many authentic proofs of the existence of those *eggs* in all viviparous females, the general *analogy* observable in all *nature*, is to a docil and discerning mind a kind of demonstration. Plants are known to proceed, from what in due propriety of speech, might be called *ova* ; for the *germ* in the plant, is in every respect like the *ovum*, found in viviparous females : likewise, all oviparous animals are known to proceed from *ova* : and there is a strong presumption, that the only difference between oviparous and viviparous animals is, that the latter are hatched and brought to perfection and life within the body of the female, the other without the body.

M. Mery opposes this generally received opinion, and further insists, that what most anatomists have hitherto taken for *ova*, are no more than little cells, full of a clear liquor ; these cells therefore cannot, with any propriety be called *ova* : an *ovum* shou'd be a separate body, enveloped in its own membrane or covering ; those *ova* in question have no such distinct covering ; besides, the common integument of the *ovaria* is of too compact a texture, to permit such soft bodies, as those pretended *ova* are to lacerate and open themselves a passage thro' it.

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The abettors of the system of generation from *ova* reply, and insist that in the first place, every individual *ovum* hath its peculiar membrane, which comes out with it, and upon its unfolding, is known to be the integuments of the future *embrio*. 2^o. The *cicatrix* found in the exterior envelope or membrane of the *ovaria* of all viviparous females, is a demonstrative proof of the exit of those *ova* thro' this membrane.

M. *Littre* had the good fortune to be able to shew both the *ova* and *cicatrix* in the *ovaria* of a woman he opened: the right *ovarium* was much bigger than what is natural, and separated inwardly into two cells, full of a watery liquor, which had intirely changed its structure: he found in this same *ovarium* an aperture 3 lines in diameter, thro' which an *ovum* had lately passed, for it was found in the adjoining *tube*: it was a line in diameter; but as the entrance into the womb from this *tube* was scirrhus and contracted, it was obliged to remain in the *tube*. In the left *ovarium*, M. *Littre* cou'd perceive thro' the common integument 2 *Ova*, each 4 lines in diameter; the covering or membrane of this *ovarium* thro' its whole extent, was half a line thick, except in those parts, where the *ova* touched it; there it was as thin as the outer skin of an onion. These *ova* appeared full of blood vessels, exactly like as
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the yelks found in the *ovaria* of fowl appear.

M. *Littre* found a 3d *ovum* in the same *ovarium*, in which was a *fœtus* a line and a half thick, and 3 lines long, attached interiorly to its membrane by the *funis*, which *funis* was one third of a line thick, and a line and a half long. M. *Littre* cou'd easily distinguish the head, and in it the mouth, with a little eminence for the nose; where the eyes should be, he observed two little lines; at the end of the little trunk, two little eminences were to be seen, each as big as a midling pin's head, and two other such eminences on each side on the upper part, all which in due time would become the upper and lower extremities.

M. *Littre* pursuing his inquiries into the same subject, observed in a woman of 25, who died soon after she was delivered in 1703, a tumor in the left *ovarium*, which was as big as a cherry, covered with the common membrane of the *ovarium*, and in the middle of this tumor an aperture a line and a half broad, thro' which the *ovum* undoubtedly had passed.

M. *Littre* found in another woman of 38, an oval body in the right *ovarium*, 10 lines long, 7 broad and 4 thick, of the color and consistence of flesh, and attached by a little pedicle to the bottom of the cavity, occupying two thirds of the *ovarium*. M. *Littre*

conjectures this must be a *mole*, which began to unfold in the *ovarium*, as *moles* are often found to do in the womb; from this he infers, that the *ova* might, in like manner, begin to unfold themselves in the *ovarium*: he thinks every cellule in the *ovarium*, might with regard to the *ovum* it contains, be considered as a little *matrix*; the *ovarium* therefore will be a common *matrix* to all the little *ova* it contains, as the *uterus* becomes a particular *matrix* to every *ovum*, that comes there for its full perfection: according to this system, an *ovum* may unfold itself to a certain point in the *ovarium*, but must necessarily be conveyed into the womb to come to its full perfection.

M. *Littre* in 1704 opened a woman of 40, who in all that time had but one child; the left *fallopian tube* closely adhered to the *ovarium*, and in it the *cicatrix* was very visible; while the least vestige of any such *cicatrix* was not to be seen in the right *ovarium*; a manifest proof, that the only child this woman ever had, came thro' the *cicatrix* in the left *ovarium*.

But what must finally and unanswerably determine this matter, is what the same M. *Littre* found in a woman of 25, who died 4 months after a lying-in: this woman he opened in 1706, the right *fallopian tube* adhered in all its circumference to the right
ovarium,

ovarium, and in it was found an *ovum*, 3 lines in diameter, part of which was without the *ovarium*; the part within the *ovarium* was in a kind of *calix*, which exteriorly appeared full of blood vessels; it was composed of two distinct substances, the interior glandular, the exterior muscular. What M. *Littre* has here discovered, are some of the most hidden mysteries of generation, which *Nature* very rarely permits us to see, much less examine into; however, this must for ever establish the generation of all viviparous animals from the *ova*, found in the *ovaria* of all viviparous females.

M. *du Verney* the younger, who for some time before had turned his thoughts to the same inquiries, examines the *uterus*'s of *quadrupedes*, *cows* and *sheep*, to see if he cou'd discover any thing like *ova* in their *ovaria*. Comparative anatomy has been always of service in discovering the real structure of similar parts in the human body.

M. *du Verney* fully experienced this in the present inquiry; for having dissected several *uterus*'s of *cows*, and minutely examined into the structure of their *ovaria*, he produced some of them before the academy; one had a *fetus* 15 days old and fully formed, another 3 weeks, and another a month old; in all which the exit of the *ovum* out of the *ovarium* was very visible; he further observ-

ed, that the aperture thro' which the *ovum* passed, was like a half moon, and that the edges lapped over each other, like the scales of a fish; upon blowing with his blow-pipe into this aperture, he observed that all the *vesicles* in the *ovarium*, as also all its blood-vessels were filled with air, but that the same wou'd not happen, upon blowing into an aperture, made with a lancet in the same exterior membrane of the *ovarium*.

Whoever wou'd see these *ova* intire, and in their natural situation, shou'd gently separate the *ovarium* in two, beginning where the blood-vessels enter it; by observing this method, those *ova* will present themselves intire; besides, we may with pleasure see, how the exterior membrane becomes thin, and where it opens to let the *ovum* out, and how this naturally happens; nor is this more difficult to conceive, than how the pods of seeds, the husks of several kinds of fruit, wall and chest-nuts, &c. naturally open to let out their seed, fruit, &c.

M. du Verney, willing to know whether the above aperture had any communication with the blood vessels, he blew into the spermatic vein; the intire *ovarium* was filled with air; part of which visibly escaped thro' the aperture.

Upon his opening another *ovarium*, in the manner before directed, he found an *ovum*,
with

with one half still in its *calix*, not unlike an *acorn* in its husk; upon blowing into it, he observed the air did pass between this *calix* and its *ovum*, and blowing after into the aperture in the *ovarium*, the air likewise distended the very membrane of the *ovum*; this unanswerably proves that what are found in the *ovaria* of all viviparous females are real *ova*, and not a simple, pallucid liquor, contain'd in cells, as M. Mery and others wou'd seem to insinuate; and at the same time finally determine the generation of all viviparous animals from the *ova*, found in the *ovaria* of all viviparous females.

A further inquiry into the mystery of generation, from my own reading and observation.

Tho' the far greater number of anatomical and medical writers have long since subscribed to *Van Horn*, *de Graaf*, *Steno Kerkringius*, and others, that all viviparous animals were produced from eggs, found in the *ovaria* of all viviparous females, yet since *Hartsoekers's* bold discovery of living *animalcula* in *semine masculino*, and *Leauwenhock's* microscopical observations, generation is considered by many as the filling up, and lengthening of the tubes of these *animalcula* already formed; consequently all the mother contributes is a *nidus* only, where the proper nourishment for the unfolding the small tubes of these *animalcula* might be had; but *Morgagni*, *Santorini*, *Nigrosoli*, who has professedly wrote on generation, also *Valisneri*, *Paiton* and others, have elaborately wrote against this system of *animalcula* in *semine masculino*. M. Needham, remarkably dexterous at microscopical observations by several experiments made in concert with M. de Buffon of Paris, as well as several others of his own, has demonstrated the impossibility of the generation of the human *fœtus* from these *animalcula*, by proving

ing they do not exist as *animalcula*, while in the vessels of the male, or during the due course of impregnation: but that they are produced in that fluid, upon its being exposed to the air, whereby it loses its natural texture, undergoing nearly the same alteration the infusion of plants and seeds do, wherein *animalcula* like those of the *femen* are afterwards seen; the production of those *animalcules*, he observes is very sudden, while that of the *animalcules* in those infusions is a good deal slower: but insists, that the animals exist in neither before the exposure to the air, and alteration of their texture.

As the future *embrio*, according to this system, is perfect and alive in the *femen*, and that all it wants is a *nidus*, where it may receive the proper nourishment to unfold and lengthen its tubes, these two consequences I apprehend do necessarily follow, 1°. As the *male* only supplies the *animalculum*, this must always resemble the *male*, and the *male* only. 2°. As the *female* contributes no more than a *nidus*, and proper food, no part of the future *embrio* can resemble the mother, of course she can neither change or otherwise alter any of its lineaments, of both which every day's experience convince us of the contrary.

For instance, a *mule* got between a *jack-ass* and a *mare*, partakes more of the *dame* than of the *sire*; all he retains of the *sire* is the extremities, the feet, tail and ears, together with the black cross on the back: the rest of his body is like the *dame*; this seems unanswerably to prove that the *female* contains in her *eggs* the first rudiments of her own *species*, and that the impregnation was able to change the less useful parts, the extremities into the likeness of the *male*. See *Pbil. Trans. Abridg. Vol. II. p. 912.*

M. *Martin* informs us, that he kept a *cock* without a *tail* with other poultry, and *hens* also of the same kind, and yet the *chicks* were so far from being like the *cock*, that tho' he was solicitous to preserve the breed, yet he seldom cou'd breed any chicks without tails; he further adds, that he had one *ben*, with the feathers upwards, and tho' he had no *cock* of the same sort, yet he had more chicks like this one *ben* than like any cock in his yard. *Pbil. Trans. Abrid. Vol. IX. p. 307. in the note.*

These

These matters of fact must ever puzzle the abettors of the system of *animalcula* to account, how it comes that the *fœtus* is not always of the same *species* with, and always like the *male*.

But secondly, every body conversant with physical writers must know, that the *females* of both the human and brute creation have so great a power over their young as to change their lineaments and features, and often totally to destroy the whole *embryo* : many instances of this may be seen hereafter, of the force of imagination of women.

But exclusive of those matters of fact, let us now turn our inquiries unto the anatomical disquisition of the parts of generation of a woman, and endeavour from thence to draw such conclusions, as may amount to a demonstration of this important question. First, let us attentively consider those principal parts of a woman, concerned in the important work of generation ; two large *ovaria*, allowed by the most eminent anatomists to be turgid with *ova*. 2^o. Two hollow tubes, well known by their first discover's name, the tubes of *Fallopian*, which are so closely connected with the womb, and whose structure and situation are such, that in *coitu*, they naturally grasp the *ovarium*, and thereby facilitate the exit of the impregnated *ovum*, which they convey after into the womb, where it comes to its full perfection. How often these *ova* have been found, some beginning to unfold in their very reservoir, the *ovarium* (see before p. 42. *et seq.*) others in the *fallopian tubes*, of which there are several instances in *Vol. I. of this abrid. p. 117*.

A serious attention to these matters of fact, deduced from the known structure of the parts of generation of a woman, must convince the greatest *skeptic*, that all this *grand apparatus* was, by the all-wise *creator*, designed for far more considerable uses than barely to supply an *animalculum* with a proper *nidus* and *pabulum*. This matter in debate must receive an additional proof from this reflection, that every *ovum*, contained in the *ovaria* of all *viviparous females* is originally composed of two integuments or membranes, which upon their unfolding, are known to be the *chorion* and *amniois*, which together with their blood-vessels are demonstrably productions of the *fœtus*, and
which

which indisputably pre-existed in the *ovum* before copulation.

As this is incontestably the case, the existence of *animalcula in sem. masc.* as the origin of all *viviparous* animals must be acknowledged to be admitted in direct opposition to matter of fact; for shou'd it be admitted that this *animalculum* might be able to work its way to the *ovarium*, penetrate it after and impregnate an *ovum*, which may be conveyed by one or other of the fallopian tubes into the womb, it will ever remain a difficult matter to explain, how this same *embryo* comes after to be united, or connected with the *placenta*, the *chorion* and *amniois*, all real productions of the *cutis*, *cuticula*, and blood-vessels of the *fœtus*, and pre-existing in the *ovum* before copulation.

Upon the whole then, I apprehend we may from *analogy*, which certainly ought to carry great weight with it, when we contemplate the manifold works of the creation, as being founded on this wise and well known maxim, that *God never employs two different means to come at the same end*, reasonably conclude, that all *viviparous* as well as all *oviparous* animals proceed from *ova*; the only difference seems to be this, all *viviparous* animals are hatched and brought to life within the body of the *female*, whereof all *oviparous* animals are by the general appointment of *nature*, hatched and brought to life without the body of the *female*. I say, by the *general appointment of nature*, for we know that *oviparous females* may, and have hatched and brought to perfection their young within their bodies. A hen has been found to hatch her own egg within her body, but not being able to exclude it, she died with it in her body, a fate that has often happened to many *viviparous females*, especially in *extra-uterine* conceptions. Upon opening this *hen* a perfect chick was found in her *ovarium*.*

To conclude, this immense number of *animalcula*, said to be contained in the seminal liquid of man, should, I apprehend rather induce us to reject this *hypothesis* of living *animalcula*, especially as the abettors of this system admit, that every *animalculum* is a perfect *embryo*; they further

* Phil. Tran. abrid. Vol. 2. p. 904.

ther confess that the number of *animalcula* in the *semen* of one man wou'd suffice to people a vast country; *Leeuwenhoek* computes there may be contained 3000000000 *animalcules* in the *semen* of one man, and that for the production of one animal only; we have here millions of little men created never to exist, which seems directly contrary to the notion we have of the infinite wisdom of the Omnipotent CREATOR, *who never created any thing in vain.*

And to tell us, *who dare pretend to penetrate into the designs of the Almighty, or examine the divers ends he proposed to himself in the creation of the universe,* can never remove the difficulty, but on the contrary, it must rather introduce universal *skepticism* to the intire subversion of all human knowledge; and indeed according to this doctrine, we must always reject as false all such things as our narrow, limited reason cannot penetrate or comprehend: how absurd is sufficiently obvious.

The same objection does not I apprehend equally lie against the system of the *ova*; for tho' it be it admitted, that every individual *female* in the creation doth contain a certain, determinate number of *ova*, capable of being impregnated, yet they are not understood to live, till impregnated by the *aura seminalis*; those *ova* will therefore remain *unimpregnated*, equally as *myriads* of the *embrios* of plants are well known to remain *unprolific*, because all access is denied to the *farina fœcundans*; what therefore the *aura seminalis* is to the *ova* of all *viviparous females*, the same the *farina fœcundans* is to the *embrios* of all plants, *a conditio sine qua non.*

A new passage for the discharge of the urine.

1701.

The promptitude with which mineral waters and some tinctures are known to pass, the sudden effect that *asparagus*, *turpentine*, *rhubarbe*, balsom of *capiivy*, and particularly

cassia, has upon the urine, which it renders as black as the very tincture, induced M. *Morin* to believe, there must be some other passage for the discharge of the urine, besides that universally allowed of by all Anatomists, *i. e.* from the lacteals in the intestines to the emulgent arteries. The better to conceive how this happens, M. *Morin* distinguishes two kinds of urine, and for each assigns its particular *route*; the first urine he wou'd have to transude thro' the coats of the stomach, from thence to glide down between the intestines to the bottom of the bladder, which it easily pervades, being in its own nature *pervious*. Why this urine more easily pervades the bladder than the intestines, is owing to a glutinous substance, with which they are covered; This will prevent the entrance of any other liquid into their cavities; this first urine therefore must necessarily be limpid, and as clear as rock-water, as it never mixed with the *chyle*, much less with the blood, where it necessarily wou'd take up some of its sulphureous parts, which is what gives urine its high color, such as is seen in common urine. The second urine being obliged to make all the rounds and circuits the chyle and blood do, till it is at last discharged by the kidneys, is always of a high color, being saturated with a part of the saline and sulphureous parts of the blood,

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The following experiment seems to countenance this conjecture. Take the stomach and bladder of any animal, fill them with water, and tie both ends close, you will find the water will transude thro' the coats of both stomach and bladder, turn the inside out of both, fill them with water, and tie them as before; the water will here in like manner escape thro' their coats; lastly, tie both stomach and bladder empty, put them thus empty into a sufficient quantity of water, so that they may float in it; in a few hours you will find a considerable quantity of water in the cavity of both.

Since the stomach and bladder out of the body are *pervious*, since both permit the water in their cavities to transude, and since both admit the water they are put into to pass thro' their coats, where is the absurdity to admit, that the same, or some thing like it happens in a living person, whenever he suddenly fills his stomach with mineral waters, or other liquids? might not these liquids transude thro' the stomach in a living person, as well as thro' the stomach of a dead person? the pressure of the stomach on these liquids will oblige a part of them to transude thro' its coats, just as by squeezing a sponge full of water in the hand, a part of the water will escape through the fingers, in proportion to the pressure.

Without allowing some such passage for the first urine water-drinkers make, it will be difficult to account for several *phenomena*, that often occur in practice. A tincture of *cassia* will pass by urine in two hours after it is taken, as black as when taken; now, had this tincture made the several circuits the chyle does, how is it possible it cou'd retain its color, and suffer no change by its mixture with the blood in the lungs? the same difficulty subsists in regard to several other tinctures, which for some time after they are taken retain both their color and smell.

When any body eats *beets*, *asparagus*, or has taken an infusion of *woad*, or taken *turpentine*, or drank mineral-waters, with which a little powder of galls had been mixed, the first urine the person makes, visibly retains both the color and smell of the things taken; for this urine transudes thro' the coats of the stomach, and so goes directly to the bladder, while the second urine the same person makes in some hours after his digestion is over, retains no other color or smell than what all urine has; for having time to circulate with the blood, the smell and color of the things taken, by the several divisions they then undergo, are totally changed.*

Blue

* What we read in the *Phil. Trans. abrid. Vol. 3. p. 157.*
seems

Blue sweats in a child 5 months old. 1701.

M. Lemery the father, received an account from M. Fornage, apothecary in Pontarlier, that a child 5 months old had constant sweats, particularly about the head, which had tinged his linen with so deep a blue as was not to be washed out.

Sudden change in the color of all the hair of the body by taking physic. 1702.

M. Lemery the son informed the academy, that a man at Orleans, about 45, of a strong habit of body, with strong black hair, and very thick on his body, happened for some disorder or other to take some of those purgative *tablets*, that are made for the poor, which wrought him so violently for some days, that he became greatly altered in his constitution, insomuch that all the hair of of his body fell off in a few months, and from black, which it was before, it became sandy; the hair on his body did not grow within the year; his beard, and the hair of his head, which before were both black and strong, became both weak and thin.

seems to confirm this passage distinct from the *ureters*. A dog's sides are there said to be opened, thro' which each *ureter* was tied: he after was made to drink good store of water; in 3 hours after, upon pressing on the bladder, a good quantity of urine issued forth; the *ureters* were found a little swelled above the *Ligature*.

M. Cassini

M. *Cassini*, upon this occasion remembered to have seen the cardinal *Caraffe's* almoner, a man about 55, from white become quite black.

An inquiry into the cause of the black color of the moors. 1702.

The skin is composed of three distinct parts. On the inner surface which is properly the skin, are found little round glands of an oval figure, together with the roots of the hair; on the upper or exterior surface of the same are found the excretory ducts of the said glands, and the hair produced from said roots, with several little eminences, as big as the smallest pin's head, which it is conjectured are the organ of the sense of feeling in man. Over this lies the *corpus reticulare*, thro' whose meshes the aforesaid excretory ducts, the conduits of the cutaneous discharges, the hair and the above little eminences pass; lastly, over this *corpus reticulare* lies the *cuticula* or scarf skin, whose inner surface is uneven, full of little holes to receive the aforesaid excretory ducts and little eminences, whilst its exterior surface is smooth and even.

Upon inquiry into the cause of the blackness of the *Moors*, both the *cutis* and *cuticula* were found as white in them as in any European; but the above *corpus reticulare* was observed

observed to be black, and shew'd itself so even thro' the *cuticula*.

The great *Malpighi* fancied the blackness of this *corpus reticulare*, was owing to the black glutinous matter it contained; to verify this matter, M. *Littre* dissected a *black*, and infused a piece of his skin in both warm water and spirits of wine for the space of 7 days, yet neither did extract any tincture from it; M. *Littre* put other pieces into boiling water, and in a little time after many little bladders were seen on the exterior surface of this skin, full of a pelucid, thin liquor, which when cold appeared like clear gelly; from these experiments M. *Littre* concludes, that the color of the skin of the *Moors* is owing partly to the particular structure of their *corpus reticulare*, and partly to the excessive heat of the sun in their country. That the excessive heat of the sun contributes to produce the black color of the *Moors*, seems confirmed by this matter of fact, viz. that all the children of the *Moors* are white born; and what is still stronger, the top of the *glans penis*, as being bare is black, while the part of said *glans* that is covered is white.

M. *Littre* further observed that this *corpus reticulare*, which in itself is as black as jet, appeared thro' the *cuticula* only like a foot-black.*

A

* Doctor *Towns* in his observations made at *Barbadoes* affirms, that

A man deaf from his birth, suddenly restored to his hearing. 1703.

A tradesman's son of *Chartres* about 24 years old, born deaf, and of course dumb, to the great surprize of all the town, began to speak all of a sudden. Some 3 or 4 months before this happened, all the bells in the town were set a ringing, as it is the usual custom of this country, on the first appearance of cloudy and stormy weather, in order to disperse the same. This lad was greatly surprized at that new and unknown sensation he then perceived in his ears. Some time after a kind of watery humor came from his left ear, and from that time he perfectly heard with both his ears; during the above 3 or 4 months, he listened only, but used to repeat to himself the words he heard, both to accustom himself to their pronounciation, as well as to their signification: he at length broke silence, tho' he cou'd still speak but badly; the *divines* put many questions to him concerning his past life; these chiefly regarded the *Deity*,

that the blood of *Negroes*, whether sick or in health is almost as black as their skin; On this account he thinks their blackness is inherent in them, and in no way occasioned by the scorching heat of the *sun*, the more so as others living in the same climate and heat, have florid blood. *Phil. Trans. abrid.* Vol. 3. p. 561.

Doctor *Barrere* in his dissertation on the physical cause of the color of the *Negroes* alledges, that the gall of the *Negroes* is black, and being mixed with the blood, is deposited between their skin and scarf-skin.

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the nature of the *human soul*, of the moral good and evil of our actions; of all which he did not appear to have any idea; and tho' he frequented the church, and appeared to behave there as others did, yet he never formed to himself any reason for what he or others went there for; nor had he any notion of death, and therefore never once thought of it; he all this time led a mere animal life, intirely taken up with those objects he saw about him, nor did he draw such inferences from them as one might reasonably expect, especially as he did not appear to want *common sense*. But the sense of a man deprived of an intercourse with others, is so little exercised and cultivated, that he thinks no more than what the external objects indispenfably oblige him to; the greatest part of mens knowledge is owing to their intercourse with each other*.

A very extraordinary case, where one became deaf and dumb in an instant.

If the above history appears surprising,

* We read in the *Phil. Trans. abridged Vol. 5. part. 2. p. 166.* of as extraordinary a recovery in a lad of 17, a native of *Stratharig* near *Inverness*, who from his birth was deaf, of course dumb. But in some weeks after his recovery out of a violent fever, he began to perceive a very uneasy motion in his brain, and soon after he began to hear, and in process of time, to understand what was spoken. This naturally disposed him to imitate others, which he did by attempting to speak. It was some weeks before he cou'd be understood distinctly, but in some time after he spoke tolerably well.

the following is not less so. In 1705 a lad about 20 became deaf and dumb in an instant, upon his being closely collar'd by a strong man he had a quarrel with; it is not from any defect in the organ of speech that one is born dumb, but from some defect in the organ of hearing; this lad became dumb in an instant, from some lesion in the organ of speech, and deaf in like manner, from some lesion in the organ of hearing. It is not easy to conceive, how both these organs were in an instant so far injured, as to be deprived of their natural functions.

A pulsation observed in the veins. 1704.

The pulsation observed in the arteries is always in proportion to the dilatation of the same, from the blood propelled into them, at every *systole* of the heart, whereas this same blood upon entering the capillary returning veins, circulates uniformly, of course no pulsation ensues. M. *Homberg* having observed a pulsation in the veins of a patient he attended, from the oddity of the thing, and what was never before taken notice of, relates here the case, and endeavours to account for this *phenomenon*.

A lady about 30, who for 15 or 16 years was afflicted with some disorders in her breast, the chief of which was a severe asthma, with a violent and continual pain in her
head,

head, accompanied with perpetual watching, and exquisite pain in her *thorax*, applied to M. *Homberg*. This lady's asthma wou'd return upon the least motion, accompanied with a violent palpitation, which wou'd last an hour or longer. All these symptoms were increased, particularly her asthma, at the time of her *menfes*; but these had left her some time before she put herself into M. *Homberg's* care.

When she was opened, the brain and all its appendages were in their natural state, tho' the deceased at the age of 12 years old got a violent blow on the head, which was near costing her her life. This blow was supposed to be the first cause of all her complaints. All the contents of both the *thorax* and *abdomen* were greatly wasted, tho' no other way affected; the stomach was scarce able to contain a pint, the heart tho' twice bigger than the natural, appeared like a dried up bag; its ventricles were large, but their sides were thin, and in both arteries was found a *polypus*, which also adhered to the ventricles of the heart; when the one in the *aorta* was dragged out, it was above two foot long, besides what still remained behind in its branches; for 6 or 7 inches it was as firm as any flesh; but after that, it sensibly became like clotted blood.

When the deceased was at the worst, in a

fit of her *asthma* with the palpitation, a pulsation was sensibly felt in the veins of both her hands and neck, somewhat different in point of frequency from that felt in the arteries; but which followed exactly those beatings the heart was found to give; when those beatings ceased, the above pulsation was felt no longer. This would happen 1. 2 and some times oftner in 24 hours.

M. *Homborg* accounts for those appearances thus; the blood entered freely into the heart, as there were no *polypus*'s in the veins; but as the heart cou'd not propell all the blood it received into the arteries, being in a great measure filled up by the *polypus*'s, it constantly remained full of blood, which both distended and thinned its ventricles; this distractile state the heart was now in, was the cause of the above violent palpitation; the natural *systole* of the heart, being here greatly increased, by the above distractile state its fibres are kept in, squeezed the contained blood more violently into the *aorta* than it otherwise wou'd, by which the blood is forced into the veins, by a kind of *subfultus*. The valves in the same veins, by the violent pressure of the heart upon the blood are forced; the blood propelled into the veins by the above sudden jerks, swells them by turns, keeping time exactly with the above convulsive contractions of the heart.

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The above sudden jerks, or recoiling of the blood in the veins, might in some sense be compared to the recoiling of rivers, when the tide sets in, and at the same time, accounts for all the several complaints of the deceased. 1° The stubbornness of her *asthma*, and its returning upon the least motion, is easily deducible from the great quantity of blood the lungs were always loaded with, which prevented their due dilatation by the air. 2°. The constant pain of the head was owing to the distractile distension of the vessels of the brain, and as this distension was continual, her watchings were so likewise. 3°. The constant pain she complained of in her breast was owing to the above distractile distension of the vessels of the lungs, which was always increas'd, when her *menfes* were on her, that discharge not being in a sufficient quantity to relieve *Nature*. This surcharge necessarily increased the above distension of the pulmonary vessels, which cou'd not be relieved, but by large bleedings.

What was very singular in this lady's case is, that tho' she never took for many months more nourishment than about an English pint of *soupe maigre*, and as much water by spoonfuls in the 24 hours, yet she did not waste considerably in her flesh. The reason is this; the necessity adults are under of taking in food is to supply the daily wastes they unavoid-

unavoidably make ; as this lady was unable to take any exercise, her daily wastes must be very inconsiderable ; the arteries being here almost filled with the *polypus's*, the circulation must be languid, the several discharges must in like manner be very few ; we know that *vipers* shut up in a box for a year will live ; and several animals are known to sleep one half of the year in the northern climates, all owing to the little exercise these animals take, their discharges must be the less, and their wastes in proportion.

This is further confirmed in those memoirs by the several instances of animals living a considerable time, and insects for years without food : in 1706, a Danish bitch in *pup* was, thro' mistake, left in a gentleman's country-house ; 41 days after she was found alive, lying on a bed very weak, without the least sign of madness : there was no remains of her *pups* or *fæces* : she got some milk to lap and did well after.

M. *du Hamel* related a similar case, another bitch lived six weeks without any food ; and M. *Maraldi* recollected that in an earthquake at *Naples* a young man lay buried for 15 days under the ruins, and survived it. M. *Froger* of *Brest* wrote that a cheese-mite shut up in one of the common microscopes lived 7 months.

In 1719, an elm as thick as a man's body

dy was cut and cloven in billets for fire, out of which jumped a toad: no elm could be found: M. *Hubert* of *Caen* attested this fact. In 1731, another toad was found in an oak-tree, much thicker than the elm, and by computation 80 or 100 years old. M. *Seigne* of *Nants* attested this fact. We find in the *Phil. Trans. abrid. Vol. IX. p. 11, 12.* two instances of beetles found alive in the heart of sound wood.

Of the force of imagination. 1704.

The same M. *Lemery* informed the academy that he knew a lady in *Paris* of a strong and sprightly constitution, but subject to passions, who from her 24th to her 40th year, had 14 children, six of whom were very remarkable, owing to the different oddities of her *fancy*; one in particular was a girl so beautifully formed, that the great *le Brun* painted a copy from it; yet when this beautiful infant was opened, it had neither liver, spleen nor intestines, but in the place of them a fleshy substance as big as a child's head, which communicated with the stomach; it was of a redish color, full of veins and arteries; this child died in 8 days after it was born.

In 1713, a woman 3 months gone with child had a longing desire for a beef's kidney, and not getting it, she that instant laid her
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her hand on her forehead, extending her fingers to the top of her head; at the end of 9 months she was delivered of a son, plump and well formed all to his head: the bones of the head were neither in their natural situation, nor of the size or figure they shou'd be; on the top of this ill-shaped head was found a cavity, in which was a fleshy substance, perfectly like a beef's kidney; this child lived 6 hours but in a stupid and weakly way: upon opening the head, there was neither *cerebrum*, *cerebellum*, nor *medulla oblongata* as far as the third cervical *vertebra* to be seen.

M. Rouaut who related the case, attributes all this disorder to the strong longing desire of the mother, which raised so violent an agitation in her own brain, that by the laws of *sympathy* it was communicated to the tender brain of her *embrio*, 3 months old, and so was dissolved; the *meninges* being no longer supported by the brain, nothing but a confusion of these parts cou'd ensue.

In 1715, a woman was delivered in the *Hôtel Dieu* in *Paris*, of a girl with a monstrous *exomphal*, which contained the liver, spleen, stomach and intestines; there was no *epiplœon*; all that the mother cou'd remember that cou'd occasion this *exomphal* was, that she had seen the bowels of an *ox* dragged out, which she confessed sensibly affected

fect her at the time: the child lived 14 hours.

In 1721, M. *Winslow* received the following account of a child born blind from M. *Botin* the younger, surgeon at *Valencay*.

In October 1720, *Ann Morel*, wife of *John le Moine*, a daily laboring man in the parish of *St. Cecilia*, and archbishoprick of *Bourges*, was delivered of a son; in 42 days after the mother brought him to M. *Botin*, as it was apprehended he had no eyes: this was the case, both orbits were empty, and the eye-lids closed, which by the many folds they made, they covered a little hole that was in the great *canthus*; M. *Botin* introduced his director into this hole, and separated the eye-lids; but they had no motion, nor did any tears follow: this fact is well attested by the Rector and principal inhabitants of the parish. It is here to be observed, that the mother of this child kept cattle along with a shepherd, who in the great frost of 1709, had both his eyes frozen in his head, which fell out of their sockets.

This case furnishes the philosopher with full proof of the force of imagination.

A further inquiry into this force of imagination from my own reading and observation.

That the fancy or imagination of all females, (human and brute) when violently agitated, hath a power or influence to mark or otherwise change the lineaments and features of their young, and often totally to destroy, and in some circumstances to deprive them of life, is an observation as old as time itself; to account satisfactorily for this

force of *fancy*, has exercised the *genius* of all the philosophers both ancient and modern, and probably will continue to do so while time lasts : however, the better to enable us to form some conjecture, how these almost incredible changes are wrought, let us attentively consider the influence the passions raised in the *soul* have over the body.

It is every day's experience that the imagination, excited by the appearance of an object, instantly raises desire, either to approach or fly from it, according to the different circumstances it is in ; if it be agreeable, the *soul* feels then as it were expanded in pleasure ; the animal spirits move pleasantly both in the brain and thro' the nerves of the heart, by which means the blood circulates placidly and regularly thro' all parts of the body, communicating every where a kindly warmth, and partaking at the same time of the general harmony now subsisting thro' the whole frame ; the eyes now appear sprightly and brilliant, the countenance serene and gay, the hands and all the members exult for joy ; but when the object appears frightful to the imagination, the *soul* is sensibly felt to sink, and may properly be said to be contracted into a narrower compass, the animal spirits seem to retire precipitately, the countenance becomes now dejected, and the limbs enfeebled, owing to their languid influx into the nerves ; the circulation of course is retarded both thro' the lungs and heart, whence the weight on the *præcordia*, next to a suffocation, a feeble pulse, paleness of the face, coldness of the extremities, dulness of the eye, in short an intire stagnation of the blood and death soon ensue.

Such are the effects the passions raised in the *soul* have over the body, effects which are almost incredible, capable of destroying the human frame, and producing almost every disorder ; the small pox and plague have been known to be contracted thro' fear, or force of imagination.

Fienus relates a wonderful case of a malefactor carried to execution, who by having his cap pulled over his eyes, and a wet cloth hastily struck about his neck, fell down dead, as if his head had been struck off*.

Schenckius relates two instances of the effects of the dreadful apprehensions of an approaching execution, in

* de virib. Imagin.

two noblemen, who in one night's time were both young and old; the comeliness of their face vanished, their hair and beard became grey, in short they appeared more like a corpse than a living creature †.

We find in medical writers several instances of children's being marked by the disappointed longings of the mother: others have been found dismembered, others with their limbs broke or dislocated, others with wounds still bleeding, others in fine whose features were totally changed from white to black, or otherwise disfigured.

Hildanus relates that a man was born without arms, by his mother's being surprized by a beggar, who wanted his arms ‡. *Turner* says, he knew a lady who being frighten'd at the unexpected sight of a beggar's stump on her coach door, was after delivered of a child wanting one of his hands ||. I have seen one *Aylmer*, now living near *Kilcock*, who wants both wrists, owing to his mother's curiosity to see a coach-maker who wanted a hand work. But the famous *Buckinger*, well known all over Europe, is still a stronger instance of this force of imagination, he wanted both his upper and lower extremities, and I am informed there was in *Dublin* a female, cotemporary with him deprived in the same manner of both extremities, called by some *stumpæ nymphe*.

2. *P. Malbranche* relates that a woman upon seeing a man broke on the wheel, was after delivered of a child with his bones broke in the same places.

Nearly similar to this is the case related in the *Phil. Transf.* vol. ix. pt. 3. p. 310. a cloth shearer's sweet-heart upon seeing her lover murdered with 20 wounds in his body, she in 2 days after was delivered of a dead child, with the marks of all these wounds in the same places of its body.

3. *Corn. Gemma* physician at *Louvain* relates that a woman in that town, near her time, being pursued by her husband with a drawn sword, with which he threatened to cut her head, she from the fright soon fell into travail, and was delivered of a child with a large wound on the forehead,

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† *Schenck*. l. 1. p. 2. et seq. ‡ *Cent.* 6. *Obs.* 66. || *De morb. cutan.*

head, as the blood issued from it in abundance, the child died instantly.*

Dr. *Cyprianus* mentions a lady, who was delivered of a child with a wound in its breast, owing to the mother's hearing some two months before, as she was going to bed, that a man had murdered his wife by wounding her in the breast with a knife; the lady was observed to change countenance and seemed concerned.||

A lady who had the operation of the *Bubonocèle* performed on her, being then with child, was soon after delivered of a child with a large wound in the same place.

4. There are several instances of women's being delivered, the European of black, and the Ethiopian of white children. *Galen ad Pison* says that the sight of a picture is sufficient to change the *fœtus* into its likeness. The tyrant *Dionysius* being well assured of this, took care to have a beautiful picture hung in his wife's bed-chamber, that he might have comely issue. It was from this knowledge, that *Hippocrates* cleared a lady's innocence, who was delivered of a child of an Ethiopian complexion, by intently viewing a picture in her bed-chamber, which the child exactly resembled.† *Heliodorus* in like manner attributes the whiteness of *Chariclea* by the queen-mother's earnestly fixing her mind on the picture of the fair *Andromeda*, which stood before her; he adds, the *Gymnosophists* very readily ascribed it to the force of imagination.¶

But to come to our own times. A potent monarch's queen was said to be delivered of a princess of an Ethiopian complexion, exactly like a picture of a beautiful black, which hung in her apartments, and that this princess became after mother-abbess of a royal-convent.

Paræ after *Damascenus* writes that a woman on the confines of *Pisa* was delivered of a girl, all over hairy, owing to the mother's beholding the picture of *John* the Baptist, drawn in his hairy vesture, which hung on the posts of her bed.‡

Ludov. Vives makes mention of a loose fellow of *Bra-*

* *Cosmocrit.* lib. 1. c. 6. || *Phil. transf. abrid.* Vol. 3. p. 222. † *St. Hieron.* in *Genes.* ¶ *apud Paræ* l. 25. c. vii. ‡ *id. ibid.*

bant, who having personated the Devil in a play, wou'd needs enjoy his wife, saying he wou'd beget a young devil on her. His wife conceived, and was delivered of a child in every respect like the diabolical dress her husband had then on.†

The patriarch *Jacob*'s stratagem in laying streaked rods before his flocks at the time of their conjunction, which our great horse-breeders imitate this day, by ordering the horse to be lead before the mare before he covers her, and what has happened to a cow in *St. Domingo* in 1722, evidently show the same force of imagination in all brute females. The above cow had a calf with fish-like scales in the place of hair. The *Cayman*, a kind of crocodil plenty in *America*, is known to be a great devourer of cows: he artfully watched this cow as she came to drink to the river, and having chased her after, so frighten'd her as to occasion her bringing forth the above calf.

Hesiod supposed by some to be older than *Homer*, well knowing the force of imagination, advised his friends to abstain from the embraces of their wives after their return from funerals, or their reflecting on any calamity that had befallen them, lest the sorrowful ideas be transmitted to the conception, and the *fœtus* be marked with some frightful character.||

We see every day children marked with the things thrown at their mothers, such as cherries, straw-berries, &c. Various methods have been employed to remove those discolorings of the skin, but generally to very little purpose; for as they often penetrate too deep into the skin, the cicatrix they wou'd leave wou'd prove a greater blemish than the stain itself; but when these resemble currans, straw-berries, cherries, mulberries, raspberries, whose *basis* will admit of a ligature, they may be easily extirpated, taking care to consume what of their roots may remain with caustics, otherwise those marks wou'd rise again, and become both more stubborn and troublesome than at first. The best time of extirpation is when they

† *Comments on St. August. City of God*, l. 13. c. 26. || l. 2. *de oper. b. et diab.*

look palest, and are flattest and softest; for like the fruit they resemble, they have their seasons of blooming, ripening and languishing, tho' they never die. See *Hild. Lud. septalius, tract. de Nævis. Turner de morb. cutan.*

Remarkable cures of a fever with delirium by music. 1707 and 8.

A famous musician, and great composer, was seized with a fever, which increasing daily became continual; the 7th day he became delirious, accompanied with shrieks, weepings, terrors, and a constant wakefulness: the 3d day after, from something like that natural *instinct* in animals, which excite them to seek for herbs to relieve themselves, he desired to have a little concert in his bed-chamber; the physician with some difficulty agreed to it: they sung to him the *cantatas of Bernier*; he no sooner heard the soft melodious strain, than his countenance assumed an air of sweetness and serenity, his eyes also became calm, the convulsions intirely left him, he shed tears of joy; he confessed after that he was more charmed with that little concert, than with any he ever before or since heard: all the time the concert lasted, he was without a fever; but as soon as it ended, he relapsed again: they took care to repeat the same remedy, which was always attended with the same success, to suspend the fever for the time; music was now become so necessary for him, that
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he obliged a relation of his own, who sat up with him, to both dance and sing, tho' very unfit for either, thro' her grief and concern for him: one night when he had only his nurse-keeper with him, he obliged her to sing the only sorry ballad she knew; however, by repeating these concerts for 10 days, he recovered without any other help, save a bleeding in the foot.

M. *Dodart*, who from very good vouchers related the above history, does not pretend it shou'd serve as a rule to go by; it is however pretty extraordinary, how this man's *soul*, which by a long protracted habit was become harmony itself, was restored to its natural composure by concerts of music. A painter would not certainly be so greatly affected by the finest pieces of painting; painting has not near the same influence on the *soul* as music has; nor can any art in this respect equal the power of music.

However extraordinary the above cure may seem, it was not long a singular case, nor the only instance of the kind: the year following 1708, a dancing master of *Alais* in *Languedoc*, who thro' fatigue in his profession in *carneval time*, was seized with a violent fever, the 4th or 5th day he became lethargic; when he recovered out of this lethargy, he fell into a most furious, but silent *delirium*, wherein he made several efforts

efforts to get out of bed, threatening all who opposed him, both with his looks and head, while at the same time he obstinately refused to take any thing ordered for him, and still without opening his lips ; M. *Mandajor*, mayor of *Alais*, a man of worth and understanding, proposed to the physician to try whether music might not have some influence on his disordered brain ; the physician did not disapprove of the notion, but was justly apprehensive of the ridicule of the public, especially if the patient shou'd happen to die in the experiment : a friend of the patient's, who had not the same reason to consider such consequences, and who cou'd play on the *violin*, took down that of his friend, and played some of those airs he knew were most familiar to him ; some present were greatly offended, and looked upon this act to be a higher degree of madness in this gentleman. The patient however, as one agreeably surprized, sat up in his bed, and attempted with his arms to beat time to the music ; for as his hands were tyed down, he could only shew by the motion of his head the pleasure he felt ; when those present saw the good effect music had on the sick man, they after gave him his way, and in $\frac{1}{4}$ of an hour he fell fast asleep, and in that time he had a *crisis*, which put him
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out of all danger *.

The difference between the milk of European women and the Negresses. 1707.

M. Homberg who was born at *Batavia*, acquainted the academy that the European women who go thither, are obliged to give out their children to be nursed by the *Negresses*, their own milk being so saltish, that their children will not suck them; whereas the milk of the *Negresses* is both sweet and pleasant, tho' the diet of both be the same. M. Homberg conjectures that the lymphatic arteries of the *mammæ* are so dilated in the European women in those warm climates, as to admit the salts of the blood to pass with the lymph, which in a colder climate,

* Music we find was antiently used to medicinal purposes, and may undoubtedly do very great service even at this day, particularly in some disorders of the mind, whereby the irregular motion of the spirits may be quieted. King *Saul's* story every body is acquainted with: *Pythagoras*, apud *Seneca de Ira*. l. 3. c. 9. quieted the perturbations of the mind with the harp; *Æsculapius*, apud *Galen*, cured disturbed minds with melody and songs; *Pindar* mentions the same thing, as does *Appollonius* the cures of the distractions of the mind, epilepsies and several other distempers by music, *hist. mirabil.* *Democritus*, apud *A. Gellium*, says the music of pipes was the medicine for many diseases, and *Thales* of *Crète* confirmed it, by his removing the pestilence from the *Lacedæmonians* by music, *Pluturch de musica*. Music not only removes several disorders, but even humanizes people naturally savage and barbarous. *Polibius* apud *Rollin* vol. iv. p. 323. attributes the difference in the characters of two people of *Arcadia* to music, the one was elegant in its manners, humane to strangers, pious to the gods, the other was generally hated, brutal and irreligious.

where the vessels are of a more firm texture, wou'd be too massive to enter them, while these same vessels in the *Negresses*, accustomed from their infancy to those scorching climates, are naturally of so firm a texture, as not to admit the above gross salts along with the lymph; their milk therefore is always both pleasant and good.

An inquiry whether there be a circulation of blood between the mother and fœtus. 1708.

Anatomists are divided in their opinions concerning this point; some contend that none of the mothers blood passes to her *fœtus*, of course none of his to the mother, but that what she supplies him with is a chyle, separated in the glands of the womb; they therefore admit of a circulation between the *fœtus* and *placenta* only; the *placenta* in their opinion elaborates the blood, which the *iliac* arteries of the *fœtus* brings to it; this is afterwards brought back by the umbilical vein, for the several uses of the *fœtus*: others affirm that there is a reciprocal circulation of blood between the mother and *fœtus*; consequently that the *fœtus* is nourished by the blood supplied by the mother.

M. Mery thinks that every day's experience wou'd suffice to clear up this point: when the *placenta* (says he) comes away, it is always blood and not chyle that is seen
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to come after it : to put this matter out of all manner of doubt, he related the case of a woman about 35, who was brought from the *hospital-general* to the *Hôtel Dieu* to be delivered : she was near her time, and in perfect health, but apprehending she wou'd be sent back to the same hospital, after she was delivered, she attempted to make her escape out of the lying-in ward, tho' very high ; for this purpose, she procured a rope, and having knotted it at certain distances, the better to hold by, she in the night fastened it to the window, but the rope being too short, when she came to the end of it, she was obliged to let herself fall into the street ; in the fall she broke one thigh bone, and put the other out of joint ; she was brought back to the *Hôtel Dieu*, where she died in half an hour : one of the surgeons opened her immediately, in hopes of saving the child's life ; but he died the instant his mother died : 8 *Paris* pints of blood were found in the *abdomen* ; the *placenta* still adhered to the womb ; and upon further examination, all the blood vessels of both mother and *fœtus* were found empty *.

M. *Mery* concludes from this fact, that there is a circulation of blood from the mo-

* It were to be wished that M. *Mery* had informed his readers what vessels in the abdomen were broken in the fall, thro' which this enormous quantity of blood came.

ther to the *fœtus* and *vice versa*; for as all the vessels of the *fœtus* were here empty, and the *placenta* still adhering to the womb, it is evident to a demonstration that all his blood was extravasated with his mother's, none being found extravasated in his body: for had not that been the case, he might be taken out alive so soon after his mother's death.

And as for glands in the womb, M. Mery reminded the academy, that in 1706 he had produced before them the womb of a woman, who died 4 hours after she was delivered, wherein no glands cou'd be discovered, nor any membrane interiorly covering the womb; nor on the inner surface of the *placenta*, which still adhered to the womb; but the mouths of the vessels of both womb and *placenta* were yet visibly open, and as the substance of both was spongy, the blood might reciprocally pass from one to the other.

M. Mery further added, that he had observed the same things upwards of 50 times, as he had so often performed the *cesarian* operation, after the mother's death, in hopes of saving the child, or at least of procuring it baptism; as therefore no glands cou'd hitherto be discovered, nor lymphatics to separate this pretended *chyle* or lymph for the nourishment of the *fœtus*; it must remain a certain fact, that it is the blood the mother
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constantly supplies, that nourishes both the human and brute *fœtus's* *.

Cures performed by uction. 1708.

A lady of about 35 was long afflicted with a stubborn and continual head-ach, attended with exacerbations, returning regularly every 8 or 10 days; in these fits which used to last 10 or 12 hours, she became either stupid or was downright mad: her chief complaint was in her forehead and eyes;

* Since M. *Mery* wrote the above memoir, the structure of the womb has been more minutely inquired into; very many able anatomists assure us, that they have discovered glands in the womb. M. *Winslow* says, he found them about the inward orifice of the womb, where they secrete a mucous humor, which in pregnant women serves to close up the mouth of the womb; he further tells us, that the cavity of the womb is lined with a very fine membrane, which at the *fundus uteri* is both smooth and of an equal thickness, is there pierced with a multitude of little holes visible to the eye, upon pressing of which some drops of blood are seen to ooze through. *Expos. anatom.* p. 574. ff. 597.

Heister likewise says, the cavity of the womb is lined with a porous and nervous membrane; in women with child the inner membrane almost intirely disappears. *Hist. comp. anat. Lond. edit.* p. 135. See also *Morgagn. advers.* 4. p. 47.

What probably imposed on *Mery* is, that he never sought for this membrane but in an impregnated state of the womb, where it almost intirely disappears.

As to lymphatic arteries, they have been long since discovered. *Morgagni* found them in an advanced pregnancy. See *advers.* 4. p. 76. M. *Ferrein* discovered them in 1741*. Besides, all *physiologists* are now agreed that the *catamenia* are discharged thro' these same lymphatic arteries, and as to the nutrition of the *fœtus*, it is agreed that it is a lymph only the mother supplies him with, and that he is nourished by the *funis* only. Who wou'd see more on this subject, let him consult the *Edinb. Med. Eff.* vol. i. p. 139. et seq.

* See vol. ii. p. 44.

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these were always inflamed in the fit; she was often troubled with *nauseas*, and wou'd vomit a good deal of *flegm*, and a greenish bitter water: during these fits she cou'd take no food, but in the intermediate time her appetite was good.

M. *Homberg* during 3 years attendance ordered her many things, but all to very little purpose; *opium* cou'd only suspend the head-ach for a few hours, but had no effect in the fit: one night as she perceived a fit coming, she went to lie on the bed, but first willing to see if her eyes were inflamed, which was to her a sure sign of an approaching fit, upon looking into her glass, she accidentally set her night-dress on fire; this night-dress consisted of a double linen cap: as she was then alone, her forehead and a part of the top of her head were burnt, before any body cou'd come to her assistance. M. *Homberg* was immediately sent for; he first ordered her to be bled, and had the burn treated in the usual manner; she not only escaped the fit she was then threatened with, but from that instant got intirely shut of her stubborn head-ach, without the least return since, now above 4 years.

A similar case. ibid.

A phyfician at *Bruges* informed M. *Homberg*, that a woman there for many years had
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her legs and thighs greatly swelled, and very painful; to mitigate this pain she used to rub them morning and evening with brandy before the fire. One night by some chance or other, the brandy took fire, and burnt the parts slightly; all she did was to anoint the parts with some common ointment: she made so plenty of urine that night, that the swellings in both her thighs and legs intirely fell, and never since returned.

History informs us of some very surprising cures, that have been performed by mere chance; the most savage people have stumbled upon such cures. M. *Homberg* remembered, that the inhabitants of the island of *Java* used to cure themselves of a kind of colic and flux, very mortal in that part of the world, by burning the soles of the feet with a red hot iron. For a *whitloe*, they only dipped the finger several times into boiling water. M. *Homberg* tried this experiment on himself, which had the desired effect.

Travellers also inform us, of several noted cures performed by *ustion*, among the greatest savages; we have also learned by our own experience, that several cures have been performed both on horses, hounds, and birds of prey, by burning the part. The *Indian moss* has been known to cure the gout, by burning it on the part. M. *Homberg* knew a *Hamburger*,

burger, who had cured himself of the gout, by the application of this *mos*. His fits used to last 2 and 3 months; it lasted but 7 days upon his first using this *mos*.

M. *Homberg* conjectures these cures are performed, either by putting the humors, lodged upon the part into motion, so as to compell them to escape by some outlet or other, or the sudden action of the fire so rarifies them, as to enable them to follow their usual channels; or lastly some of the vessels which brought these humors in so great abundance to the part, are destroyed by the fire, which prevents the return of said humors.

An extraordinary ripeness in a girl of 4 years old. 1708.

M. *Langlade* surgeon at *Carcassone*, informed M. *du Verney*, that he had examined a girl then about 4 years old, who by the account her parents gave him, had her *catamenia* since she was 3 months old. At 4 months she was 3 feet and a half high (French measure), the rest of her body was in proportion; her *mammæ* and *puclenda* were as fully formed as those of young maidens of 18 generally are: she every way appeared marriageable. What travellers tell us of girls having children at 9 years old in the eastern countries, must for the future cease to be so great a wonder.

A remarkable sign of youth in an old woman of 106.

The same M. *Langlade* further adds that he had seen an old woman of 106 years, who still had her *menfes* regularly. This seems to be no less a contrast than the former uncommon ripeness in a girl of 4 years old being marriageable.

A very extraordinary ripeness in boys.

Females in general are allowed to be earlier ripe for procreation than males; this is every day's experience in the brute creation. We have also some instances of the like early ripeness in males. In 1695 the magistrate of *Besançon* acquainted the academy, that near *St. Claude*, there was a boy, who at 6 months cou'd walk, at 4 years he appeared capable of the act of generation; at 7 he had a beard, and was of the common size of a man.

In 1736, a peasant's wife from *Normandy* produced before the academy her son, who was then 7 years old; his mother from his very infancy was sensible of his extraordinary growth; he grew half a foot every year, till he was 4 years old, and then he measured 3 feet and a half. When he was measured before the academy, he was 4 feet 8 inches and 4 lines in his stocking feet. His mother observed that at 2 years old his *genitalia* were arrived at their full perfection; at

4 years old he was able to pitch into the rack a bundle of hay 15 pds. weight, and at 5 he could pitch into the waggon a sheaf of corn, weight 25 pds. with as much ease as a man of 20 cou'd. However forward this boy is in his body, his rational faculties do not surpass those of the same age; nor shou'd we be surprized at this, when we consider, that the enlargement of the rational faculties is always in proportion to the number of ideas we acquire, which indispensably require a considerable time; add to this, that a boy of his circumstances must necessarily, for want of proper opportunities to enlarge his mind, remain longer in ignorance than another of the same age, who has all the advantages of a good and liberal education.

This same boy in 1739 had increased but 3 foot 2 lines, which holds no proportion to his rapid growth at first. Probably a pleurisy and the small-pox, which he had in that time, might be the occasion; in 1741, then 12 years old he measured but 5 feet and a half, yet he still has the strength of body of a man of 20.

M. Geoffroy, who made the proper inquiries into this affair, conjectures that this young *giant* had made too free an use of his early manhood.

We find another instance of the like ripeness in a foundling, received into the hospital at *Roan* in 1743; at 4 years old he appeared

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ed as big as boys are generally at 7; his body was as well formed, and his strength was equal to a boy of 7, but his *genitalia* were as full grown, as they are at 20; the hair about them, and his voice were in like manner as manly; but his thighs, legs and feet were in no proportion to the rest of his body; he therefore walked feebly and tottering; and what is more afflicting to him, his intellects hold no sort of proportion to this extraordinary growth of his body. He scarcely knows the use of speech, tho' one can't say he is deaf; for by certain sounds and signs, he will come and go, shut a door, tho' it must be confessed, not much better than a dog well trained wou'd do. M. le Cat sent the above account to the academy in 1744.*

An uncommon fruitfulness in an old woman of
83, 1710.

The bishop of Sees informed the academy

* In 1744 there was a boy of more uncommon ripeness born 6 miles north of Cambridge. At his birth his *genitalia* were remarkably large, and at a year old covered with a *Lanugo*. At 2 years 11 months he measured 3 feet 9 inches and better, and weighed 4 stone. His voice is manly, his understanding equal to boys of 6 years old. He is so strong as to fling a black-smith's hammer 17 lbs. wt. and overcome boys of 6, 7, and 8 years old. He does not fight them with his fists or feet, but collars them, and lays them prostrate by mere strength, and yet he eats and drinks very moderately. His *penis* when in erection is 4 inches long, and the hair on the *pubis* is thick and an inch long. He has something of a stately walk with him and seems conscious of that uncommon share of strength the author of *Nature* has endowed him with. *Phil. Trans. abrid. Vol. xi. p. 1205.*

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that he knew a man in his diocese, aged 94, who had married a woman of 83, on whom he got a child, and was delivered of it at her full time. This would seem to insinuate that the patriarchal age is not yet quite over.*

An inquiry into the cause of the melancholy delirium, and occasionally of the seat of the soul.

Were it not a common received notion, that the brain was the seat of the rational faculty in man, there wou'd be the same reason to assign the lungs, the liver, or any other part one pleased to be the seat of this faculty; for if the structure of these parts have no sort of affinity with the thinking faculty, that of the brain has full as little: for this purpose, it wou'd be necessary to find out some part in the body, to which all the motions or sensations raised in the body, did ultimately tend. The necessity of such a part is what induced the great M. *Descartes* to fix on the *pineal gland*; but it is now well known, this gland has no such prerogative; nor is there any other part, as yet discovered that has, whereunto the impressions, made by the *soul* on the body tend, tho' phi-

* In the magazine for June 1763 we find a more extraordinary fruitfulness: a woman of 94 is there said to be married to a 3d husband who was 105 years old; in 14 years they lived together they had 3 children, who bear evident marks of their parents old age, they are grey already, they never had any teeth, their backs are bent, in short, they have all the signs of decrepitude. All these particulars are said to be well attested.

losophers speak very familiarly of such a place ; no part of the brain appears proper for this purpose ; neither do we know any thing certain about the nature of the *soul*, or of its manner of acting on the human body.

However perplexing this may seem, yet men were always willing to take up some *hypothesis* or other to explain this matter. M. *Vieussens* the son, in order to explain this melancholy *delirium*, supposes the *centrum ovale* to be the seat of the *soul* ; for according to the system of his father in his *Neurology*, the *centrum ovale* is composed of an infinite number of fine tubes, which communicate with each other, by the means of other tubes, infinitely finer again. It is in the former of these tubes the *juccus nervosus* is elaborated, and from these is carried into the second order of tubes, in the form of animal spirits ; it is in these almost imperceptable tubes all those motions are made, which correspond with our *ideas* ; and the impressions these motions leave on those fine vessels, are the traces, which recall the *ideas* of such things as we before knew. The *centrum ovale* is placed where the origin of these nerves is. This *hypothesis* once admitted, it is easy to see, that the soundness of reason necessarily depends on the regularity, equality and freedom of the circulation of the *animal spirits* thro' their proper tubes.

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When many of these tubes are collapsed, as is the case in sleep, the spirits that move thro' such as are open, raise incoherent *ideas* in the soul: this is the source of dreams. When all those nervous tubes are open, the animal spirits rushing impetuously into them, raise such crowds of *ideas*, as the *soul* has not time to distinguish or compare, and this causes a *frenzy*; but when some of the same nervous tubes are obstructed, and the spirits cease circulating thro' them, such *ideas* as depend on those obstructed tubes are then lost to the *soul*; so that when she comes to want those *ideas*, she necessarily forms incoherent judgments, this is the *melancholy delirium*.

This *hypothesis* receives some degree of probability by considering what occurs in this disorder; as it proceeds from obstructions, the blood is always fizy, the circulation is languid, the patient is without a fever. Such as live in hot climates, where perspiration is so very considerable, have always fizy blood, as well as those, who live on coarse food, use little exercise, or are seized with some great and sudden grief, which soon coagulates the blood; all such persons are observed to be most subject to this kind of malady.

Of the seat of the soul. 1741.

That the *soul* is united to the body, and that it is according to the laws of this union,
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the *soul* acts on the body, and the body affects the *soul*, no body ever doubted; but to what part of the body is the *soul* united has been long controverted. Various have been the opinions of philosophers concerning this part or seat of the *soul*.

The first notion that occurred to men, concerning this matter was probably this, that the *soul* by its own nature, could not be united to any one part more than to another; and in strictness could occupy no place, but must by its union influence all parts, every part of the body being capable of the sense of feeling; but if there was any part, that merited this preference to make it the seat of the *soul*, the nervous system seemed to be that part, as the nerves are known to be the instruments of both motion and sense, and are besides distributed to all parts from their origin in the brain to the remotest part of the body; but the *soul* is not united in this general manner to the nervous system; for some are known to lose a leg, some an arm, and yet their reason was not in the least impaired after.

All Anatomists are now agreed that the *soul* is seated in the brain, but are not agreed as to the particular part, there being no one part but some one writer or other has made it the seat of the *soul*. The best method to guide us thro' this intricate inquiry seems to be, to consider whether, when most parts of
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the brain happen to be sphacelated, or otherwise destroyed, there yet remained some one part sound, and that while this part remained sound and untouched, reason subsisted; it is evident the *soul* can be seated in this part only that remained sound, and by no means in those parts that had rotted, or were otherwise consumed; by this method of inquiry we shall necessarily come to find out the immediate seat of the *soul*.

In the first place, the soul cannot be seated in the cortical part of the brain: a peasant of 18 years old had his skull fractured by a stone; some splints of the inner *tabula* of the parietal bone wounded the *meninges* and brain; on taking these out, besides clotted blood, a good spoonful of the very substance of the brain came away, yet he recovered, without any injury or lesion of the functions of the soul remaining.

There is a pregnant instance of this kind of a young woman, whose skull was fractured, thro' which a considerable part of the brain was discharged, and yet she perfectly recovered. See Vol. 1. of this abrid. p. 173.

There are several instances to the same purpose to be found in medical writers. Thus a woman long afflicted with a megrim, died at last; upon opening her head, the right hemisphere of the brain was found rotten, and yet she retained her reason to the last.*

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* Bonet. Sepulchr. tom. 1. p. 76.

A man wounded in the head was thought to be cured; as he was going to be discharged the hospital, he died suddenly; upon opening the head, the brain was found rotten, even down to its ventricles.* A soldier happened to have his scull fractured, thro' which the brain came; this man like the former was judged to be cured, yet he died suddenly in convulsions; his brain was also found rotten.†

A noble Venetian was wounded on the head, whence followed a great loss of the substance of the brain, and yet he recovered.‡

Alphonfus of *Bologna* was like the noble Venetian wounded in the head and recovered, tho' he lost a considerable part of his brain.‡ There are many more similar cases to be found in medical authors, but these sufficiently shew the *soul* is not seated in the cortical part of the brain. 2°. The soul is not seated in the *pineal gland*; for this has been often found either petrified or impostumated, or scirrhus, and wanting in others.¶ 3°. Nor in the *nates* and *testes*; *M. de la Peyronie* found these impostumated in a woman of 28 years old, and yet she retained her reason

* *Bonet. ibid. p. 283.* † *Costeri obs. p. 330.* § *Schenck. obs. p. 19.* ‡ *Fr. Arceus. l. 1. c. 6.* ¶ *Bonet. Sepulch. tom. 1. p. 257.*

to the last. 4°. Nor in the *infundibulum*; this has been found suppurated like the former. 5°. Much less is the *soul* seated in *Willis's corpora striata*. M. de la Peyronie related the case of a man of 30, who received a thrust of a sword in the great *canthus* of his right eye, which penetrated the very brain; this man became *paralytic*, had now and again head-achs, lingered 2 months, and died greatly wasted. Upon opening his head, an abscess was found occupying the whole *corpus striatum* of the right side, it even extended to the *thalamus* of the optic nerve of the same side, and yet this man always enjoyed his reason to the last.

M. Petit in his *Lettres d'un medecin*, &c. mentions a similar case of an officer, who retained his reason to the last, tho' he had an abscess 3 inches long by 2 broad and 2 deep, situated in the same *corpus striatum*. He mentions another case, where this *corpus striatum* was quite dissolved, into a substance not unlike the lees of wine: he has also a case where the *cerebellum*, its peduncles and the *basis* of the *medulla oblongata* were wounded by a musket ball, and yet during the 43 hours this man lived, he answered pertinently to such questions as were asked him. His sense of feeling was likewise very exquisite; for upon touching him he quickly withdrew the part.

From

From all these observations it evidently follows that the *soul* is not seated in either the *cerebrum*, *cerebellum*, its peduncles, *medulla oblongata*, *nates* and *testes*, *corpora striata*, *thalami nervor. optico.* nor in *Descartes's pineal gland*, seeing all these parts might be either impostsomated, sphacelated or otherwise destroyed or even taken away, without impairing the functions of the soul; but whenever the *corpus callosum* is any way affected, both sense and reason are then visibly lost: to confirm this point, M. de la Peyronie related several cases.

1°. A man of 32 was observed a year before he died, by intervals to be quite absent; at times to complain of a weight on his head, was stupid; in his lucid intervals he retained his memory, but in 6 months he quite lost it: his senses by degrees left him, became lethargic and died. Upon opening his head, the upper part of this *corpus callosum* was found almost intirely consumed by a thick lymph half suppurated; what remained of it was not distinguishable from the great disorder it was in; the remainder of the brain was in a natural state, except that its vessels were more turgid with blood than usual: there is a similar case in *Bonetus*, where a peasant had his head fractured; the wound was cicatrized the 7th day; but when he was thought cured, he fell into a

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lethargy,

lethargy, lost all sense and reason, and died. the brain was found rotten, as also this *corpus callosum* *.

2°. Another man of 50 lost his memory two years before he died ; during this time he was subject to some slight heaviness and giddiness in his head ; had often violent head-achs ; during these fits he was void of reason, and when he was out of them, he forgot every thing that happened ; he cou'd not remember even the actions of his youth ; he became by degrees stupid ; in some time after his senses failed him, and at last intirely left him : during this time, he had often epileptic fits, which used to last a full hour, and was often delirious : upon opening his head, an abscess was found directly where the sagital and coronal futures meet ; it penetrated as far as the *corpus callosum*, and even to the *thalami nervor. optico.* and behind the *corpora striata*, those on the right were more affected than those on the left ; but he was no way paralytic.

These cases seem plainly to evince that the *corpus callosum* cannot be affected without both reason and sense being impaired, the following case seems to put this matter beyond all doubt.

A young lad about 16 had the upper and fore part of the parietal bone contused by a

* *Bon. Sepul.* tom. i. p. 160.

stone ;

stone ; as there appeared no fracture, the sole point then in view was to hasten the exfoliation, accordingly every thing went on smoothly till the 25th ; the patient began then to complain of a weakness in his right eye, being now grown heavy and painful, especially when pressed on ; in 3 days after he lost the sight intirely of this eye, and with it almost all his senses, with a total sinking of every vital action : the proper incisions were now made ; a small fissure of the external table of the cranium appearing, the trepan was applied in 3 different places ; the splints from the inner table, that wounded the *dura mater* were extracted ; but as the same symptoms still continued, and as the *dura mater* appeared discolored, it was laid open, and together with better than 3 ounces of a very thick, ill-digested matter, some of the very substance of the brain came away, which by the introduction of the probe, was judged to press on the *corpus callosum* ; this matter was no sooner discharged than his sight was restored with his reason, and his heaviness removed.

But what is in this case very apposite, and greatly to the point in question is, that as often as this ulcer was filled with *pus*, the patient as surely lost both his sight and reason, and became stupid, all which wou'd disappear upon taking off the dressings, and
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and evacuating the compressing matter; even the injections employed to deterge the ulcer, were observed to produce the same effect, to deprive him of all sense and feeling, which upon sucking back the same with the syringe, restored him to his reason. M. de la Peyronie observed, that letting upon his *meningophylax* fall gradually by its own weight on the *corpus callosum*, the effects were the same, which upon withdrawing it, were equally removed, as upon removing the dressing or sucking back the injections: this lad was perfectly cured in 2 months time, nor was his reason in the least impaired after, tho' he lost a considerable portion of his brain.

Schenckius has a similar case *, the patient was wounded in the summit of the head with a sharp-pointed instrument, which occasioned an abscess; as the matter cou'd not find vent, the patient was seized with epileptic fits and a stiffness of all his members, and afterwards with a tremor; they now hung him up by the heels, by which means the matter of the abscess was evacuated; and with it all the symptoms disappeared; both his sense and reason returned: the patient was perfectly cured.

M. de la Peyronie's syringe wou'd more commodiously empty this abscess.

M. de la Peyronie related several cases of

* *Obs.* 4. p. 19.

his own knowledge, whereby it appears that the *corpus callosum* cannot be either compressed, sphacelated or otherwise injured, but both reason and all sensation are abolished, from all which he concludes that this *corpus callosum* must necessarily be the immediate seat of the *soul*.

As a further confirmation of this matter, he added, that he attended a boy of 8 years old, who upon a fall had fractured the parietal bone: upon being trepanned, the splints were taken out, yet the symptoms continued nearly as in the preceding case, which induced him to lay open the *dura mater*; but as there was no blood extravasated, and as the surface of the brain appeared no way altered or affected, he went no further: the boy died in 3 months after; during the last month he lost all sense and reason.

Upon opening his head, he found under the incision he made in the *dura mater* an abscess, which rotted both sides of the *corpus callosum*: he adds, "had I plunged my lancet into the brain, where I suspected this abscess lay, I might probably save this boy's life."

This shou'd be a warning to others how to act in similar cases.

A man of 60 complained of a sharp and sudden pain in his head, which made him give a great bawl: he instantly lost his senses, but recovered them soon after. Not long after

after he became paralytic, and by degrees lost all his senses; he lingered 2 or 3 days and died: upon opening his head, a clot of blood, as big as a pigeon's egg was found, lying on the left *corpus striatum*, with its base extended as far as the *corpus callosum*.

Another man of 25 complained of exquisite pain in the right side of his head, which did not last above an instant; it became after supportable and continued half an hour; after this he gradually lost his senses, and all that was now felt was a feeble motion in the heart; the patient died in about 3 hours after his first seizure; upon opening the head, a hard clot of blood, the bigness of a pullet's egg was found, which so considerably pressed on the *corpus callosum*, as to flatten it greatly; every thing else was found.

Another man of 40 complained of a sudden and sharp pain in the same part of the head as the last man; he that instant became paralytic in his left foot, leg and thigh; he afterwards lost the use of his left arm, and his senses: he died the 4th day. Here likewise was found a hard clot of blood pressing on the *corpus callosum*.

Two other men about 40 were seized in nearly the same manner; they were let blood and puked; one died the 3d day: here was found a dry, hard clot of blood, of a bril-

brilliant red color, pressing on the *corpus callosum*: there was no *serum* found in the ventricles of the brain. The other recovered his senses in about 30 hours, but in spite of every means employed for his relief, he died the 5th day: the clot found here was considerably less than in the former case; but the ventricles of the brain were full of a redish *serum*, which undoubtedly had only the extravasated blood; and this was the reason why the clot of blood was here so much less than the former: in the first volume of this abridgment, the substance of the brain is there said to be soaked in *serum*, which distended both ventricles of the brain: the patient was mopish*, undoubtedly owing to the pressure of the *serum* on the inner surface of the *corpus callosum*†; there are to be found among authors several instances to the same purpose.

An *Italian* baron, who had been for a considerable time before stupid, being opened after his death, a hard tumor was found over the *corpus callosum*‡.

A gentleman had been for 10 years wrong in his head, became stupid after; he never wou'd call for food, and what is more, he never wou'd take any unless he was forced; he wou'd sleep for ever, and if he was asked a question, his answer was very incoherent:

* p. 163. † Bonet. *sep.* tom. i. p. 138. ‡ *id. ib.* p. 163.

he died at the end of 6 months; upon separating the two hemispheres of the brain, a round tumor as big as a middling apple was found on the *corpus callosum*, it appeared to be a scirrhus gland, both fleshy and spongy *.

A clergyman became *imbecile* all of a sudden; he died soon after of an apoplexy; upon opening his head, there were found over the *corpus callosum* some round, whitish bladders full of a pituitous humor †.

A smith received a kick from a horse on the lower part of the *os frontis*; he became very stupid, and lost all his reason; he tore off the dressings, wou'd get out of bed, and hurted himself; he died. There was found an abscess in the ventricles of the brain, which by pressing on the inner surface of the *corpus callosum*, occasioned both his stupidity and want of reason ‡.

A child six years old received a blow of a pistol on the head; he lived 18 days, during which time a good deal of the brain was discharged by the wound; he however retained his sense and reason. Some hours before his death he became lethargic, without losing intirely his senses, and wou'd even answer to such questions as were asked him. Upon opening his head, the brain was found consumed to the bigness of an egg: the ob-

* *ib.* p. 256. † *ib.* p. 259. ‡ *Manget. bibliot. chir.*

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' brain is not so necessary for life as peo-
' ple imagine, for the *soul*, which resides
' in the most solid part of the brain, is not
' affected by the *derangement* or waste of the
' other parts.' *Zodiac. gall. an.* 1676.

*That baths, w'rether cold or hot, will cure rheu-
matisms.* 1710.

To assert that baths, whether cold or hot, wou'd cure a rheumatism, appeared to some a *paradox*. M. *Homberg* however to clear up this matter, considers a rheumatism as proceeding from an acrid *serum*, very capable of exuding thro' the coats of the lymphatic veins, and dispersing itself after in the interstices of the muscular fibres, vellicating their coats, and depriving them in some measure of their motion; the great subtility of this *serum* will always enable it to exude and disperse itself, by which means it becomes less compressible, of course less able to be taken up by the re-fluent veins. Now, it is equally the same thing, whether this acrid *serum* is discharged by the pores of the skin, or compelled to return by the re-fluent veins to the common store, the mass of blood, to be afterwards discharged by the several emunctories of the body: the warm bath will effectually discharge this acrid *serum* by the cutaneous

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emunctories; the cold bath, by the pressure the whole frame is put into, will oblige this extravasated acrid *serum* to return to the common current, the blood; and herein the cold bath has apparently the advantage of the hot bath, as the cold bath braces and winds up all the vascular system, and by that means prevents any future lodgement of the same acrid *serum* on the parts; whereas the hot bath (at least too frequent an use of it), may it is to be apprehended, relax the vessels too much, and by that means too often dispose them to permit the redundant, acrid *serum* to ooze thro' their coats; whence so frequent relapses after the too long use of warm baths.

Of animal secretions. 1711.

Every body conversant in medical knowledge knows, that there are humors of different kinds separated from the mass of blood, circulating in an animal body; among those are the *saliva, gastric, pancreatic and intestinal humors, the bile, the urine, cerumen aurium, &c.* the organ or part that separates those juices or humors is called a *gland*. Now, all secretions suppose two things: 1^o. That the humor to be separated, is actually contained in the fluid, brought to the strainer or *gland* *;

* See the note in vol. i. p. 151.

and

and 2°. That the gland or strainer will admit that kind of humor or juice it is to separate, with an intire exclusion to all other juices whatsoever, brought along with it.

Physicians have adopted several *hypotheses* to explain how secretion is performed ; some will have the blood brought to the gland, to be there put into a fermentation (a *leven* is supposed to be lodged there for that purpose), whereby the juice there separated is produced ; but as this opinion was attended with so many inconveniencies, it is now universally exploded. Others fancied the glands were so many sieves or strainers of different diameters, which will let pass such juices or humors only, as correspond with, or are proportionable to their respective diameters ; as no such structure in the glands has hitherto been discovered, this opinion is also laid aside. Others believe it sufficient to explain how secretions are made, to suppose a proportion between the diameter of the secreting vessels and the particles of the humors to be secreted : this however did not fully answer or explain how secretions are made ; for in this *hypothesis*, the fine parts wou'd promiscuously pass with the coarse, thro' the large secreting vessels, so as to leave little for the narrower secreting vessels ; besides, those humors secreted in the larger secreting vessels shou'd abound more in finer parts

parts than those secreted in narrower secreting vessels, which is false in fact; for the urine abounds more in the blood, and is besides finer, than the bile: according therefore to this system, the urine shou'd go off with the bile.

These difficulties obliged others to have recourse to *imbibition*, that is, they suppose that each gland on its first unfolding, was imbibed with that peculiar humor it was ever after to separate; and of course it must ever after refuse admittance to any other, as we see filtrating paper, when it once has imbibed one kind of liquor, it will let that liquor and that only pass, whilst any other liquor mixed with it is retained on the *filter*.

M. *Winslow* adopts this opinion: he says, he often observed that the glands of the smallest *fœtus*'s were tinged with those liquors, they were ever after to separate, this seems greatly to corroborate this opinion of imbibition.

M. *Winslow* agrees with other anatomists, that a gland is no more than a congeries of veins, arteries, lymphatics, nerves, secretory and excretory ducts: he found that most glands have a small cavity, into which the secretory duct discharged the secreted humor, from which the excretory duct takes it up and carries it after to the place of its destination: in other glands he observed that the
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the secretory and excretory ducts communicated with each other, as the veins and arteries do; and here he observed, that the inner surface of these secretory ducts were lined with a fine down or spongy substance, which nearly fills up their cavity; this spongy substance is of a different color in different glands, and this is observable, even in the glands of the smallest *fœtus*'s, equally as in those of adults, from whence there arises a presumption that this spongy substance upon its first unfolding, was imbibed with that particular liquor, it was in due time to separate from the mass of blood.

The good effects of warm bathing in the small pox. 1711.

M. Lemery the son, perceiving that the small pox did not appear in its proper time, ordered the patient to be put into a warm bath, by which means the small pox came out very kindly.

A further inquiry into the good effects of warm bathing, &c. in the small pox, from my own reading and observation.

This practice of relaxing the skin by means of warm water, upon the first appearance of the small pox we find to be *coeval* with the disorder itself. *Rhazis*, if we believe himself, is the first of either the antients or moderns, who wrote any thing satisfactorily on the subject, recommends a *balneum vaporis*: “by this management,” says he, “not only the skin is softened, and disposed to receive the erumpent matter, but the strength of the patient is also preserved,

“preserved, so that nothing can be more proper.” *Rhaz.* c. vi. apud *Mead.*

Boerhave likewise recommends warm stupes to the inferior parts of the body, such as the feet, hams, groin, thighs, and legs. *Sf.* 1394. *de Variolis.*

Martin of *Lusanne* in *Switzerland* has further confirmed the good effects of warm stupes to the face, and even the whole body, repeating them every four hours, till the pock is fairly out; he there assures us, that those stupes calm the agitation the patient most commonly feels upon the first seizure of the small pox; and that they not only bring out the pustules sooner, but also prevent their pitting. *Memoir de l'acad.* 1737.

This practice of relaxing the skin, upon the first seizure of the small pox becomes abundantly more necessary in those our western climates, than what I apprehend has hitherto been properly attended to, especially with regard to all rickitty children, whose skin, thro' a long protracted use of the cold bath is become both hard and dry; to this dryness and hardness of the skin is owing, why the eruption is so slow in its appearance, and why the pustules are so small, scarce ever filling kindly; in such straitness of the skin, nothing so proper as warm stuping, *pediluvia*, &c. which relaxes the skin and the whole vascular system; besides, by a judicious management of these stupes, &c. the variolous matter might be diverted from the head and chest; for exclusive of *Sydenham's* observation, every man, the least conversant in practice, must know that the danger here is always to be estimated from the number of pustules about the face and chest, and not from those about the other parts; for when the face and chest are full of pustules, the membranes of the brain and lungs are loaded in like manner, whence the *delirium*, difficulty of breathing, &c.

The good effects I experienced from the warm bath in the small pox, brings into my mind the case of one *M. Gates's* daughter, a girl about 10 years old, who from the first seizure was delirious, very ungovernable, knocking her head against the bed posts, &c. tho' she was properly and early enough emptied, she continued in this way 4 or 5 days, the pock all the while appearing under the skin only;

I here

I here ordered her into the warm bath, which had so good an effect as to bring the pock out fairly ; and tho' it turned out a fiery ill-looking one, intermixed with many bladdery pustules, some as big as pidgeon's eggs, yet she recovered and is still living.

*An inquiry into the cause of flatulent tumors,
windy stitches. 1714.*

All flatulent tumors proceed undoubtedly from extravasated air. But how comes this air to be extravasated? M. *Littre* conjectures that this always proceeds from a stagnation of the blood in some of the vessels. The air circulating with the blood makes continual efforts to be at liberty. It penetrates the cells of the part, and by that means produces those flatulent tumors in question.

The windy stitches that often afflict weak and feeble persons are in like manner easily deducible from the same air, now at liberty, separated from the blood, with which it was intimately mixed while it remained fluid and in motion, but now painfully distending the cellular membrane. It must be confessed, that the same distractile pain may be owing to an acrid *serum*, infiltrated into the part, which by stimulating those sensible nervous parts, might excite very exquisite pain, which very readily might bring on a fever and other accidents, as is often the case in rheumatisms. In such cases tepid warm baths seem to bid fairest for present relief. M. *Littre* adds some

observations he has made on those, who die of *hemorrhages*, viz. That their arteries are always found empty of blood, but distended with air, while their veins especially those near the heart, are turgid with blood. It is the reverse in all those who die of any other disorder. It is scarce credible what M. *Littre* here relates, viz. that he had seen several persons of both sexes, who in the space of 12 or 15 hours lost near a bucket full of blood; yet far from dying, in 3 or 4 months after they were as well as before the accident.

This much is certain. There is no cavity in our bodies capable naturally, of containing so great a quantity of blood. When therefore inward *hemorrhages* become mortal, it is owing to a pressure from the blood, and not from the loss of the blood extravasated. A few ounces of blood extravasated on the brain for example, by its pressure alone, will not only interrupt the secretion of the *animal spirits*, but also their influx into the nerves, whence palsies, lethargies, fever, gangrene, and even death, might and often doth ensue. A small quantity of blood extravasated in the lungs will in like manner soon occasion a shortness of breath, attended with most of the above symptoms, and finally end in death.

An

An inquiry into the force, that carries on the circulation of the blood in the fœtus. 1718.

Since the revival of anatomy it remained a general received opinion, that the circulation of the blood in the *fœtus* depended entirely on the mother. The contraction of her heart propelled the blood into the mouths of the capillary branches of the umbilical vein, which inosculate with the capillary uterine arteries. The umbilical vein brings the blood to the *fœtus*, to expand and unfold his parts and nourish the same. What is not employed for these uses is brought back to the *placenta* by the umbilical arteries, which inosculate with the uterine veins, in the same manner the uterine arteries inosculate with the capillary umbilical veins. No body hitherto objected to this opinion till M. *Rouhaut*, who has examined these parts with more accuracy. He thinks, had this matter been properly attended to, it wou'd appear that to unfold the minute parts of the *fœtus*, there shou'd necessarily be a constant, uniform proportion between the impelling force of the fluid, employed to unfold the infinitely small tubes of the *fœtus*, and the resistance, or strength of these minute tubes, for it is evident nourishment cannot be duly performed, where the circulation is too vivid. A just proportion therefore between

the impelling force of the nutritious juice, and the resistance of the unfolding tubes, is absolutely necessary. Now it is sufficiently obvious, that there can be no proportion between the contractile force of the heart and arteries of the mother, and the tender unfolding tubes of the *fœtus*, especially during the first period after conception. During this first period, the force with which the mother impells the blood, wou'd be sufficient to destroy the first tender lineaments of the *fœtus*. And even when he has acquired a more firm texture of parts, of course opposes a greater resistance to the impell'd fluids, the impelling force of the mother shou'd then increase in proportion to the resistance of the *fœtus*'s vessels; that is, if it was the mother that impelled the nutritious juices into the vessels of the *fœtus*, her impelling force shou'd increase, as the vessels of the *fœtus* acquired more strength, as their resistance encreased, which does not appear to be the case. The contractile force of the mother's heart and arteries in the general continues pretty nearly the same during the whole time of her pregnancy. It does not vary according to the different periods of her child's age. M. *Rouhaut* who has more particularly examined the structure of the *placenta* and its vessels, takes upon him to solve this mystery. He asserts that the circulation

culatation of the blood in the *fætus* is carried on by his own powers alone. In this case, it is obvious that the impelling force of the fluids of the *fætus* will always be in a just proportion to the resistance of the tender, unfolding vessels in every period of a growing *fætus*. He confesses that the first nutritious juices sent to the *fætus*, were impelled thither by the mother; but ever after, what nutritious juice is brought to the *placenta*, is there taken up by the extremities of the umbilical vein. The mother has no farther share in the force, that distributes the said juices to unfold the vessels of the *fætus*. The umbilical vein accompanies every where the several divisions and subdivisions of the umbilical arteries, the whole *placenta* being a congeries of veins and arteries. The instant the heart of the *fætus* contracts itself, the instant following all his arteries enter into contraction, as do those of the *placenta*, being a continuation of his arteries. These arteries must of course compress the umbilical vein, which accompanies them every where. This pressure of the arteries on the veins helps forward the blood in the umbilical vein, in the same manner the *aorta* in the adult helps forward the blood of both *cava's*. It is therefore the contraction of the heart and arteries of the *fætus* that carries on the circulation of his juices to unfold and
nourish

nourish himself, which in every period of his growth, is proportionable to the resistance of his vessels.

M. *Rouhaut* asserts, that not above $\frac{1}{4}$ of the blood brought to the *placenta*, by the umbilical arteries is taken up by the uterine veins: he found by his injections that $\frac{1}{4}$ only of the umbilical arteries communicated with the uterine veins, while the *placenta* adhered to the womb; all the remainder of the vessels of the *placenta*, veins and arteries, communicate with each other; so that most of the circulation of the blood and juices of the *fœtus* is carried on between him and the *placenta*, independant of the mother: therefore six parts out of seven of the blood, brought by the umbilical arteries, circulate in the *placenta* only, where it is elaborated anew, which together with the constant supply from the mother is brought back to the *fœtus* for his nourishment.

Vision greatly affected by a fall. 1718.

A lady happened to fall from her horse, and in the fall she came with her head to the ground, and was thereon rendered speechless and senseless. She was let blood immediately, but as she did not recover her senses by the next morning, the surgeon observing a tumor on the left *crotaphite* muscle, laid it open, upon suspicion that the *os mali* was

was fractured ; there was however no fracture : this wound was 4 months healing. This lady has scarce any sight in her left eye ever since her fall, and what is more extraordinary, it wou'd involuntarily roll towards the little *canthus* : this eye appeared by degrees to observe the same motion of the right eye : but what is here very extraordinary is, that whenever she looked with both eyes at any object, in a straight line, the object wou'd appear to her to have turned to the left 8 or 10 paces from the place it really was in, and she cou'd no otherwise see it, but by turning her head to the left shoulder. But by shutting one eye, no matter which, she then cou'd see the object in the place where it was ; but upon opening the shut eye, the object wou'd appear to her to skip to the left : thus both the well and weak eye, when employed together, interrupted vision, which is never perfect with one eye ; after she had read 4 or 5 lines in a book, all she cou'd see after was a parcel of letters, which seemed to her tumultuously to skip about the paper : cou'd the imprudent section of the *crotaphite* muscle be the cause of this extraordinary phenomenon ? the baths of *Balaru* and *Barege* had no effect. M. *Duffey* physician at *Ville franche*, sent the above account to M. *du Verney*.

How

How to bring those drowned back to life. 1719.

It is a current opinion among the vulgar, that those drowned are suffocated by the quantity of water, forced into the stomach and intestines, and even into the lungs, whereby the functions of those parts are suspended. However, *Beckerus* in his treatise *de Submersorum morte sine pota aqua*, assures us, that having opened two men and a dog that were drowned, he found no water, either in their stomach or lungs.

M. *Littre* having an opportunity at the *Chatalet* * of seeing a great many bodies that were drown, observed they had a good deal of froth about their mouth and nose, and their stomachs swelled with a good deal of water in it, less in their intestines, and scarce any in their lungs, tho' the *larynx* was open and the *epiglottis* raised; this looks like a contradiction; for when the *epiglottis* is raised, what cou'd hinder the water's entering the lungs?

M. *Littre* to account for this, considers that when a man gets under water, he very

* Where all the bodies taken up out of the River *Seine*, or that are found dead in the streets of *Paris*, are exposed for some days, as well to have them known and claimed by their friends, as to make the proper inquiries how they came by their death: a king's physician attends regularly at the opening of all such bodies, in order to discover the cause of their death, as also to make the proper report to the chief magistrate.

naturally shuts his mouth to prevent his swallowing any of it ; but as his nostrils remain open, he can't prevent some of the water's getting this way into the *gula* : this water has here two effects ; the first is to relax the *oesophagous* muscle ; the second to stimulate the muscles of the tongue, so as in a short time by depressing the *epiglottis*, to force some of the water into the *pharinx* ; the very muscles of the tongue become by degrees so relaxed as to permit the *epiglottis* to rise, by which means a little of the water may be able to enter into the *trachea*, all this happens while the person is alive ; but when he is once drowned, the *epiglottis* is then depressed, and not one drop of water can enter the *larynx* : but when the person drowned is taken out of the water, the *epiglottis* by its own elasticity rises up ; this was the case in those persons M. *Littre* examined, as he discovered by endeavoring to depress their *epiglottis* ; he always found, that upon taking off the pressure, it wou'd rise of itself.

This still confirms that a living man only can swallow any water, when drowning ; for if a dead man was thrown into water, not one drop of water wou'd be found, the gullet being intirely closed up, and the *epiglottis* depressed immediately after death. Tho' M. *Littre* always found water more or

less in both the stomach and lungs of those drowned, he thinks it was in too small a quantity, especially in their lungs to occasion their death: in the asthma, dropfies of the thorax, &c. persons live a long time with a good deal of serum or pus infiltrated in their very substance: those therefore that are drowned are not deprived of life by the quantity of water they might have swallowed, but thro' want of air to distend the lungs: the circulation of the blood is now stopped, and with it life ceases.

M. *Senac* conjectures that those drowned are as soon dead as those that are strangled, or the *Negroes*, who are known to deprive themselves of life in an instant, by doubling back their tongue, by which means they preclude all entrance to the air into their lungs, which suddenly stops the circulation of the blood, and with it life.

This death he thinks must be very easy; for as the blood cannot return from the brain, as the lungs are collapsed, it compresses the origin of the nerves, and by that means they are soon deprived of all sensation.

Why the bodies of those drowned are in some time after found floating on the water is owing to the air contained in the blood, which while the animal is alive, is in a compressed state, but after death, this air being

no longer compressed, expands itself, and being lighter than an equal volume of water, it helps to buoy up the body. *Mem.* 1725.

A further inquiry how to restore those drowned to life, from my own reading and observation.

Not only the *Grecian* and *Arabian* physicians, but likewise most of the succeeding physicians down to the days of *Platerus* imagined, that all those drowned were deprived of life by the water, that had forced itself into both the *trachæa* and stomach; in consequence of which false notion they employed such means, as they apprehended were the speediest to compel those unhappy wretches to discharge this water as soon as possible. Agreeable to this doctrine, some were ordered to be hung up by the heels; others were laid on their bellies across an hoghead or barrel, recommending to roll it from side to side, imagining that by this means the *abdomen* and *thorax*, being compressed, the waters in their cavities must necessarily be evacuated: it was with the same view they advised to use such means as are known to provoke vomiting.

Were it not for the noble discovery of the circulation of the blood, I am of opinion we shou'd not be able this day to prescribe much better for our patients in the like circumstances; it is it that has enabled us to shew, not only the absurdity, but the danger also of such practice. We now know that the life of all organized bodies depends on the free ingress and egress of the air into, and out of the lungs, whereby the circulation of the blood thro' them and the whole body is carried on.

Every day's experience convinces us, that whenever this free admittance of the air into the lungs is prevented, (let the cause be what it may), the circulation of the blood thro' the lungs and whole body is then stopped, and the animal in a very short time after is assuredly deprived of life.

As this is undoubtedly the case, the primary and chief indication, in all such pressing circumstances is to procure as speedily as may be, this free admittance of the air into

the lungs, that the circulation of the blood thro' them might be restored, and with it life recalled.

Now, as all those drowned are exactly in the same circumstance with those strangled, whether by their own or by the hands of justice, the water acting nearly the same part the rope put about the neck does, (depressing the *epiglottis*) and as there are several instances recorded by men of the most undoubted veracity, of many of those poor unfortunate wretches, tho' seemingly dead, being restored to life, so I apprehend it is a duty incumbent on every humane man, to be aiding and assisting, as far as is in his power or knowledge, in the recovery of the life of his unfortunate fellow-creature. I shall therefore set down here such directions as appear to promise the speediest relief to these poor wretches. Our first care shou'd be, after the body is taken up, and his cloths, if any he has on, have been for expedition sake rather ript off, to wrap him up in warm flannels, and convey him with all speed to the next house. Experience hath taught us the necessity of this first care : for no person drowned was ever known to be brought to life, who had been left long exposed to the free air ; the external air soon chills the feeble motion the heart might still retain.

Now all hands shou'd be employed, some to rub his belly, others his limbs, especially the soles of his feet and palms of his hands ; nor shou'd they omit to rub the *spine* of the back, from the *nape* down to the buttocks with warm cloths, before a gentle fire.

The spinal marrow being the origin of a great many nerves, besides the heads of the muscles subservient to respiration being attached to the *spine*, and their tendons to the ribs, a friction on the *spine* cannot fail to put these nervous and muscular fibres into motion.

While some are busied in this manner, others may be employed in stimulating the olfactory nerves, which are known to have an immediate connection with those of the muscles, that are destined for respiration : this may be done by thrusting the bearded end of a quill, first dipped into vinegar, into both nostrils : where more stimulating things

are

are at hand, such as spirit of *sal ammoniac*, *marum syriacum*, *euphorbium* in powder, or even *tobacco*, these may be either injected or blown with a quill into both nostrills. If these things shou'd operate, they will necessarily excite a violent expiration, sufficient to overcome the resistance the included air finds to its free discharge; the respiration by this means will be restored, and with it life recalled.

Others may make the like attempts to excite a vomiting, not with a view of discharging any imaginary water, supposed to be contained in the stomach, but to excite the motion of the *diaphragm*, whose influence on the motion of the heart is well known.

While all this is a doing, the bed should be prepared and well warmed, and the patient put into it, still continuing the frictions, especially on the *spine*, and not to be discouraged, tho' no signs of life shou'd appear after an hour or two spent in this *good work* as *Mead* calls it. *Ess. on pois. p. 175.*

Here wou'd be the time to throw up some stimulating clyster, were the conveniences for it at hand; but as this is not often the case, I wou'd advise to blow the smoak of *tobacco* up into the intestines, with a common *tobacco-pipe*, putting the small end into the *anus*, and lapping the bole in a doubled silk handkerchief, to prevent its burning one's mouth, to blow up the smoak into the intestines, and continue blowing some time.

The speedy and most surprising effects of the smoak of tobacco in a like case, so well attested by Dr. *Brubier* of *Paris*, I shall here transcribe for our reader's information.

' As a ferry-boat was crossing the river *Seine*, at *Passy*
' near *Paris*, one of the passengers, a woman, tipped off
' unobserved from the stern of the boat, excepting to a
' child. When the boat had reached the opposite shore,
' the woman's husband missing his wife, and no body being
' able to give any account of her, except the child,
' he had the boat immediately rowed back to the very spot,
' where the child pointed she had hid herself (these were
' his expressions). As the place was shallow, the husband
' soon brought his wife to land. When he laid her out,
' some advised to hang her by the heels, others recommended

‘ mended divers other means. In the mean time a soldier
 ‘ with his pipe in his mouth came by, and being curious
 ‘ to know the cause of the great concourse of people, and
 ‘ being informed of the accident, took his pipe out of
 ‘ his mouth, recommending to the husband to put the
 ‘ smaller end into her *anus*, and covering the *bole* of the
 ‘ pipe with paper that had several pin-holes made in it, to
 ‘ blow the smoak into the intestines. At the fifth blast
 ‘ they heard a considerable rumbling in the woman’s bel-
 ‘ ly, upon which she discharged some water by the
 ‘ mouth, and in a moment after she returned to life.’

As it is known from experience, that *venesection* is one of the most efficacious expedients for restoring persons drowned to life, so a surgeon shou’d be called in as soon as may be, to make the speediest revulsion from the brain possible, by bleeding in the jugular or *saphæna*. For it is with those drowned as with those seized with a sanguine apoplexy. The brain is found turgid with blood. No secretion, much less an influx of the spirits can be expected, till some part of the pressure and load on the brain is taken off. Bleeding therefore is indispensably necessary.

If *venesection* shou’d not recall life, the *dernier ressource* is *Bronchotomy*, the most expeditious method of performing it is with the *trocar*, which no surgeon (especially in the country where accidents of this kind happen the oftenest) shou’d be without. This instrument passes at one thrust into the *trachæa*, introducing the pipe at the same time. where the *trocar* is not at hand, let the surgeon with an abscess-lancet, or a two-edged knife, make at once an incision thro’ the integuments and *trachæa*, and introduce a *canula* or pipe into the wound; should the surgeon happen not to have a proper pipe, let him get a common tobacco-pipe, broke to within an inch of the *bole*, and blow from thence with all his might into the *trachæa*.

As it very frequently happens that those drowned are very speedily after taken up, in which case all that is requisite to restore life is to open their *trachæa* with all expedition, and as these cases as frequently happen remote from either town or village, of course where no surgeon can be had soon enough to perform the operation, I would have
 any

any rational man present *boldly* to make a longitudinal incision into the *trachæa*, about an inch long, with any sharp-pointed knife, and with a common tobacco-pipe broke short, as before directed, to blow, and continue blowing into the *trachæa*. The lungs by this means may be soon inflated, and thereby life restored.

Besides that M. *Sharp* in his operations of surgery, assures us, that *Bronchotomy* is *absolutely void of all danger*, I can from my own experience affirm, that any man of common understanding, tho' unacquainted with surgical operations, may safely perform this operation as here directed, in all such urgent cases as call for this speedy relief. I have known men and women, who in a melancholy fit, had cut and mangled their *trachæa* in a transverse and oblique manner, and yet they survived it, as they happen'd not to wound any of the large blood-vessels. There is not therefore the least danger in performing this operation when necessary.

And indeed what danger can there be of injuring a person, who appears to be already dead, and who, if he is not really dead, must soon be irretrievably so, if he is not speedily succoured?

We find a recent instance of the little danger attending the cutting of this *trachæa* in Dr. *Huxham's* relation of a cure performed on a man, who had his *trachæa* cut almost through, see magaz. for July 1763; we therefore should not delay opening it in every pressing case that may require it; time is here very precious; one single moment often determines between life and death; let us therefore consider, that it is a principle founded on the eternal and immutable nature of things, that we kill those whom we do not preserve, when we have it in our power.*

Of the Catamenia. 1720.

As women are destined by the appointment of *Nature* to carry their young for 9 months, and during that time to furnish them

* *Quem non servasti dum potuisti, illum occidisti.*

them with the necessary nourishment for their growth and increase, so *Provident Nature* has supply'd them with more blood than men, which surplus of blood is regularly laid up, as it were in store, for those uses. When women are not with child, it is as necessary for their health, that this surplus of blood shou'd regularly, and at stated periods be discharged the body, not only to rid them of so great a load, but also to keep open the vessels of the womb, that it may be always prepared to receive the *semen virile*, to impregnate the *ovum*. The sex generally begin to pay this tribute to *Nature* about their 14th year; because about this period this surcharge of blood is no longer necessary for their own growth. They become exempt from the same about their 50th year, it being no longer necessary for the same purposes.

Nurses are seldom subject to those periodical evacuations, except in their first months of suckling; because the suck they give the infant as effectually removes the *plethora*, so natural to women, as the *menfes* do. It has been controverted whence the *menfes* come. Some contend they come from the womb alone, others from the *vagina* alone, and some will have them to come from both womb and *vagina*. M. *Littre* had an opportunity of determining this matter in a woman

man, who had a *prolapsus uteri*. In this woman the *menfes* were visibly feen to come from the womb only.*

In feveral others, who died about the time their *menfes* fhould appear, he always found the womb turgid with blood, and its inner furface full of *cryptæ*, and thofe full of blood, infomuch that upon compreffing the body of the womb, the blood was feen to iffue thro' the faid holes.

M. *Littre* difcovered the like holes in others, who died during their pregnancy; but in them the holes were abundantly narrower, and it was not blood, but lymph that now iffued thro' them; in all other women, he obferved that the above holes were imperceptable, and all that did iffue from them was a fine, clear liquor.

From all thefe obfervations M. *Littre* concludes, 1°. That the *menfes* are exempt from any deleterious quality, contrary to what the ancients foolifhly imagined. 2°. That it is a fine lymph the mother furnifhes the *fætus* with. 3°. That the *menfes* are no more than a *furplus* of fo much blood, as is every day, for a month or thereabouts, accumulated, and which partly by its own weight on the uterine arteries, and partly by the *vis a tergo*, periodically dilates the uterine lymphatic arteries for its difcharge; and if it be true

* See fimilar cafes in Vol. I. p. 119. alfo *Morg. adverf. anat.*

1. p. 45.

what some anatomists assert, that the uterine arteries are larger and more numerous than their corresponding veins, this inequality in the capacities of the uterine vessels will naturally account for this accumulation of the blood, a true *plethora uterina*. The uterine veins cannot bring back all the blood brought to the womb by the uterine arteries. What we have related in Vol. I. p. 307 et seq. concerning the inequality of the pulmonary arteries and veins renders what is here said of the inequality of the capacities of the uterine vessels the more probable.

Why the *menfes* generally cease after conception is, because they are then employed, first to dilate and unfold the *placenta* and its membranes. 2^o. To unfold the parts of the little *embrio*, which as it grows bigger every day, becomes able to consume the whole. Now, in order for conception, it is necessary that all the uterine vessels are constantly kept open, otherwise the *aura seminalis* cou'd never arrive at the *ovarium* to impregnate the *ovum*, where probably it first begins to unfold, before it is brought into the womb by the *fallopian tube*. What confirms this is, that it has been observed, that the best time for conception is, when this periodical discharge is well-over. All the vessels of the womb are then open; its contractile force is of course then stronger, both to retain the
semen

semen virile, and to forward it to the place of its destination, the *ovarium*.

A surprizing virtue of a stone in curing epilepsies. 1724.

M. *Hauterive*, late procuror-general at *Martinico*, and correspondent of the academy writes, that the Indians do find a green stone in the river *Orenoquo*, which is a specific in *epilepsies*, the bigness of a pin's head being sufficient to effect this extraordinary cure. There are two manner of ways of employing this *wonder-working stone*: the first is to wear it in a ring open underneath, so that the stone might touch the flesh, the second is by making a slight incision in any part of the skin, so as to lodge the least atom of this stone, which is found sufficient to perform the cure. M. *Hauterive* was a witness to the effects of this second method, the person had not a return of his disorder for 15 years; he further tells us that he got some of this stone set in a ring, in order to have it always ready to apply it when necessary.

The *Spaniards* in those parts informed the same gentleman that their *carocoli* (a composition of gold and a certain kind of copper brought from the *Terra Firma*) is a specific against head-achs and megrims. As M. *Hauterive* had been greatly afflicted with the head-ach, he had some of this *carocoli* set

also in a ring, and confesses he has been freer from his head-ach since he wore it; but does not pretend to attribute this intirely to the virtue of his ring. Chance or some change in his constitution might be the occasion of this greater ease from his head-ach as much as his wearing a *carocoli* ring.

The human body alternately decreases and increases in its height. 1725.

How many things pass daily before us that escape, not only a vulgar eye, but even the most accurate observer! among many others this alternate decrease and increase, which must be *coeval* with the creation, is a glaring instance: this curious discovery made in *England* no sooner reached *France*, than several began to verify the experiment; among others the *Abbè de Fontenu* of the Royal Academy of *Belles lettres*, had the curiosity to verify it on himself, repeating and diversifying the same all manner of ways for a year: the first observers who only measured themselves night and morning, believed their decrease was owing to their being awake and in action, as their increase was to their being asleep or at rest.

It must be confessed it was very natural to think, that an erect position of the body might diminish the height, as the upper parts press more then on the lower; add to this, the

the necessary and often violent motion the body is obliged to make, which must exhaust the spirits, whereas the quite contrary happens during sleep; but *M. de Fontenu* discovered, that this alternative depended a good deal on the experimenter's manner of living; for he found that the body increases after dinner, for a certain time, in proportion to the supplies the blood then receives, but that after this, when the perspirable matter has been, by reiterated circulations, so far elaborated as to be fit to be discharged, the body becomes after visibly shorter: this decrease therefore in the height of the body is interrupted in the day time, by taking in a due quantity of food, and increases in proportion of this quantity of food, and the proper time of taking it, or as the experimenter happens to use more or less exercise before or after his meal, or affects this or that attitude of his body at the time.

M. de Fontenu discovered that this alternate decrease and increase had its certain limits, beyond which it seldom went; it never exceeded 6 lines in him, which is the 123d part of his stature: this was nearly the same every day, owing no doubt to the great regularity in his manner of living; but upon comparing the decrease and increase of several months together, to see how they tallied, he discovered that he had gained one
line

line in one month, which he did not lose after, but continued rather gaining for 12 months, which he found to amount at the end to 6 lines; this increase he attributed to the constant care he took, during all that time, and even often in the day, to keep his body straight, especially when he measured himself; this observation might be of service to those, who have the care of young delicate bodies, especially where there may be reason to apprehend such bodies are not likely to grow tall.

Our experimenter found that whether he measured himself on his knees or sitting, the difference was the same, as if he had measured himself standing; this evidently shews that all this depends on the cartilages of the spine, which in the day-time and during exercise are depressed, and expanded to the same state after rest, or after a plentiful meal: he further observed, that if he leaned his body against any thing solid, during this increase after his meal, that this was not only greater, but quicker also, owing no doubt to a part of the weight on the spine being taken off for the time; the cartilages have then the more liberty to expand themselves: this observation induced M. *de Fontenu* to call this involuntary, to distinguish it from another he calls voluntary, as being owing to the different attitudes of the
body

body, which are in our power : how he came to discover this was thus. After he had measured himself one evening, and found he had lost 6 lines, he happened to lie for a very short time on a couch, and measuring himself after, he found he had regained the 6 lines he lost ; but wou'd, upon standing upright for as short a time, lose them. He conjectures that this sudden increase and decrease must be intirely owing to the lower extremities, as the compression and expansion of the cartilages of the spine are more regular, of course cou'd not be the cause of this sudden increase and decrease.

M. *de Fontenu* observed further, that his *thorax* measured cross the *cartilago xiphoides*, was 3 lines broader in the evening than in the morning. Asthmatics have long since mechanically discovered that the position of their bodies they cou'd more freely breathe in, was sitting and leaning forward, with their back supported, and their extremities in a line with the trunk, the *thorax* measured in this situation is generally 20 lines broader than when upright.

Why new-born infants do not see for some time after their birth. 1727.

M. *Petit*, who has in a more particular manner examined into the structure of the eye, discovered that the *cornea* in all new-born

born infants was considerably thicker than in the adult, it being in them a line thick and often not above half a quarter of a line thick in the adult: their *cornea* besides being thick, is also wrinkled, owing to the small quantity of aqueous humor, which in them does not weigh above a grain and a half, whereas in the adult it weighs from 5 to 5½ grains: the defect of vision in all new-born infants is therefore owing to the thickness and wrinkling of their *cornea*, together with the want of a sufficient quantity of the aqueous humor, to keep it duly extended.

M. *Petit* having examined for six weeks successively the eyes of new-born infants, observed that the *cornea* became every day more convex, smother and more glossy, which he attributed to the daily increase of the aqueous humor, which as duly extended the *cornea*, rendering it both more convex and thinner; the *pupil* also he observed became more capable of dilating and contracting itself; and as more rays of light did pass every day to the *retina*, this gradually acquired a more firm texture, of course became more sensible of the impressions made on it; vision therefore became gradually more perfect.

M. *Petit* further observed, that all new-born infants eyes do not equally and in
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the same given time acquire that convexity and glossiness requisite for perfect vision : for some he observed acquired it in a month, others not before 5 or 6 weeks, this depending in a great measure on the vigor and strength of the child, and force of the circulation of his blood, whereby the aqueous humor is secreted in a quantity sufficient to extend the *cornea*, so as to suffer a sufficient number of rays to pass on to the *retina* to perform vision.

M. *Petit* made the like experiments on the eyes of most of the new-born quadrupeds ; he is of opinion, that all new-born quadrupeds, whose eyes are open at their birth, or remain closed for some days, are in the same condition with new-born infants, *i. e.* do not see for some time after their birth, owing to the same cause.

In the course of this inquiry, upon dissecting a calf's eye, he happened to discover that the chrystaline was opake ; this surprized him a good deal ; in order to clear up this matter to himself, he went to the veal-market, where he examined above two hundred live calfs heads, to see if their crystalines were opake, but with all his researches he never cou'd discover one that was opake : upon reflecting with himself what cou'd be the reason of this phenomenon, he happened by chance to hold in his

hand one of those opake crystalines ; he was surprized to find it soon became transparent ; willing to discover the cause of this sudden change in the color of this crystaline, he laid it on his *Bureau*, where it soon became as opake as it was at first ; he brought it after to the fire ; it presently recovered its transparency ; he often repeated the same experiment, the result was always the same ; from whence he concluded that the crystaline is never opake in any new-born animal.

M. *Petit* to support his reasonings, concerning the defect of vision in new-born infants, subjoined the history of a gentleman, who consulted him about a defect in one of his eyes ; this gentleman cou'd distinguish the light well enough, but cou'd not the objects. M. *Petit* cou'd discover nothing exteriorly in the eye ; but upon comparing it with the well eye, he found it to be less convex ; upon this he concluded, that the defect was owing to the wrinkling or corrugation of the *cornea*, from a diminution of the aqueous humor, proceeding from an obstruction of its secretory canals, joined perhaps to too great a stricture of the fibres of the *cornea* ; accordingly, he ordered him a *collyrium*, wherein some nitre was dissolved, which by diluting the obstructing matter, and relaxing at the same time the fibres

fibres of the *cornea*; soon restored him to his sight, and as evidently shewed, that the defect in his eye was owing to the want of the necessary convexity in the *cornea* from a diminution of the aqueous humor.

Bad consequence attending the putting the feet in cold water. 1730.

A young gentleman of about 14 years of age, after violent exercise, put his feet into cold water to cool himself; he was seized soon after with a fever, which ended in an abscess of the liver. Upon opening this abscess, both blood and bile were discharged, and every day some part of the liver was seen on the dressings, and some of the coats of both the sanguin and biliary vessels.

M. *Soulier* an eminent surgeon of *Montpelier*, who attended this young gentleman, contrived a *canula*, round at one end to prevent its irritating the liver, but pierced on all sides with several holes to give issue to the matter; and to prevent the matter's excoriating the skin, he put a thin plate of lead on the wound, under the outer end of the *canula*; this was attended with so good success, that the fever diminished daily, the patient soon recovered his *embonpoint*, the ulcer cicatrized in a very short time; this is attested by Messrs. *Chicoyneau* and *Pourraigne*, physicians of *Montpelier*.

An old man of 84 cut four new teeth. ibid.

M. du Fay, physician at port l'Orient, informed M. Geoffroy, that a carpenter 84 years old, had cut 4 new teeth, two incisores and two canini *.

* We find many similar cases in the *Phil. Trans. abrid.* vol. iii. p. 297.

Joseph Shute, a man of 81, cut a new tooth the 3d grinder of the upper jaw of the right cheek.

Mary Stert, aged about 75, a healthy person, lost about the 40th year of her age 3 of her upper *incisores*, she remained toothless as to them till about 25 years after, when she perceived a new tooth came forth without pain, and another in about 2 years after without pain also.

Dr. *Slare's* grandfather had all his teeth strong and firm till he was 80 : in his 82d he began to drop one, soon after a 2d, and in 2 or 3 years they all dropped out, and young ones filled up their room, for he had a new set quite round ; his hair from a very white color, became much darker ; he continued in good health without any disease, and died in the 99th or 100th year of his age, of a *plethora*, as the doctor conjectures, for want of bleeding.

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*An inquiry into the figure of the heart in its
systole. 1731.*

A dispute arose this year between two candidates for a professorship in the university of *Montpelier*, become vacant upon M. *Astruc*'s being called to *Paris*, about the figure of the heart in its *systole*; one contended it became long, founding his opinion on what M. *Winslow* asserted in 1725, that the opinion of the heart's growing short in its *systole* was an error; the other contended the heart grew short in its *systole*, both parties appealed to the Royal Academy.

M. *Hunauld* was appointed to consider this matter; he began by quoting the greatest anatomists, such as *Harvey*, *Lower*, *Steno*, *Vieuassens*, who one and all affirm the heart grows short in its *systole*; *Schelegius*, *Borelli*, with some others, but especially M. *Winslow* are of a contrary opinion.

M. *Hunauld* examined before the academy the hearts of several live animals, such as cats, dogs, pigeons, carp, frogs, vipers; this method shou'd seem the speediest to decide such disputes; but it is far from being so; for the hearts of animals by such experiments exhibit such irregular motions, one time it is sudden, at another it is very slow, which renders it extremely difficult positively to determine the matter; those only who
are

are accustomed to see such experiments can form any judgment of the matter.

As for M. *Hunauld*, he positively affirmed that he always observed that the heart grew short in its *systole*; he confesses he was formerly of another opinion; but upon reflecting on an observation of M. *Borelli*, where he says the longitudinal fibres of the heart, which go from its base to the point, are fewer in number than the transverse fibres: these being more in number must by their construction shorten the heart.

While this matter was treating in the academy, M. *Bassuel*, a surgeon in *Paris*, proposed his reflections on this subject; he was heard with pleasure; he contended that the heart grew short in its *systole*, founding his opinion on the disposition and action of its valves.

The valves in both the auricles must be in a state of contraction when the heart is in its *systole*, otherwise the blood wou'd return into the auricles; again, when the auricles are in their *systole*, their valves must then be in a state of relaxation; otherwise the blood cou'd not fall into the ventricles of the heart.

From this short exposition of the different states and actions of the valves of the auricles of the heart, it evidently appears that the valves of the auricles are in a relaxed

laxed state when the heart is in its *diosole* : the heart receives then the blood from the auricles, and it is as evident that the same valves are in a state of contraction, when the heart is in its *systole*, which they cou'd not be, if the heart did not grow short ; *i. e.* if its *apex* did not approach its base ; for the tendinous columns in the ventricles of the heart, on which the motion of the valves depend, wou'd never permit them to ascend to close the auricles in the heart's *systole*, if the *apex* from whence these tendinous columns arise, did not at the same time approach the base of the heart ; in the *systole* therefore of the heart, its *apex* approaches its base, or in other words, the heart becomes then short.

What is every day observed upon opening of bodies seems to confirm this ; the valves are always found adhering to the sides, as they ought to be, to suffer the blood to fall into the ventricles of the heart ; and it is evident to the eye that to raise them to close the auricles, the above tendinous fibres become visibly relaxed, which cou'd never happen, if the *apex* of the heart, whence they arise did not at the same time approach its base, these valves in their next *systole* must as they are raised up, shorten the heart, otherwise they cou'd not close the auricles to prevent the return of the blood
into

into them ; the heart therefore grows short in its *systole* Q. E. D.

M. *Bassuel* cited *Lower*'s experiment, which seemed more decisive : *Lower* having filled one of the ventricles of the heart with water, he pressed it at the *apex* with a view to shorten the heart a little : the valves were then observed to raise themselves, and join and adjust themselves so as not to suffer one drop of the water to escape ; this experiment was more visible when M. *Bassuel* gently pressed the base of the heart and one of its sides at the same time.

The academy however judged it became them better to let this matter remain undetermined, till time and further experiments shou'd clear it up more to their satisfaction *.

Some remarks about the axungia humana. 1732.

M. *Hunauld* observes, 1°. That generally one finds a good deal of fat under the skin of all *fœtus*'s and young children, and scarce any about their heart ; the younger they are the less there is of this fat, while the heart of adults and the vessels about it, tho' they be considerably leaner than children are found covered with fat.

2°. The *epiploon* of children is proportion-

* Dr. *Parsons* in 1743 takes a review of this matter, and from undeniable experiments proves that the heart grows short in its *systole*. See his *Recherches sur le mouvement du coeur*, &c.

ably less fat than that of adults ; and let children be ever so fat, their mesentery is not near so fat as that of adults, let them be ever so *meagre*.

3°. That some old people extremely *meagre*, had their bowels loaded with fat.

4°. When the *membrana adiposa* is filled with fat, we are then said to be fat, and *è contra* are said to grow thin or lean, when its cells are emptied of their fat : according to M. *Hunauld*'s observations, it is the outer cells that fill first and empty last.

Strange effects from different situations of the body. ibid.

It is scarce credible that the paroxysm of a fever, which had eluded the force of all the known medicines, shou'd cease returning, merely upon the patient's getting out of bed, and sitting in his chair.

It is however a matter of fact, which fell under the observation of M. *Martin* of *Lausanne*. As a further confirmation of the fact, he adds two cases full as extraordinary ; in one a man after his first sleep is surely seized with convulsive motions, if he remains in bed. Another man had all the difficulty in the world to speak while he was in bed, supposed to be owing to a blow he sometime before got on his head. Who wou'd ever have thought that an horizontal situation of

the body, so universally comfortable to all sick persons cou'd have so contrary and bad effects?

A Negress had a white child. 1734.

M. *Helvetius* informed the academy, that some 10 months before the account he had from *Surinam* was wrote, a Negress was delivered of a white child well formed, but with all the features of a black, and even their woolly kind of hair, which here was as white as snow, and tho' exposed to the sun, never changed color: the white of his eyes was uncommonly white; the *Iris* was of a flame color, speckled here and there with some whitish lines; the *pupil* was likewise of a fiery red color; he cou'd not open his eyes in the sun, but wou'd in other places, and cou'd see where others cou'd not; when he looked stedfastly at any object, both the *iris* and *pupil* seemed to turn rapidly round their own centre. And then the child seemed eagerly to look for and have a desire for something: he had the *pi-am*, a disorder peculiar to the *Ethiopians*.

The question now was, who cou'd be the father; it cou'd not be a black, tho' the mother positively affirmed the father was a black; it is known, that the children of all the black are born white, all to the top of the *penis*, and roots of the nails of their hands;

hands ; but in a few days after their birth, they become black ; the child of a *Negress* and a white is born red, by which they are known ; but this child remained white 10 months after he was born, and after all his father cou'd not be an European white ; for were it so, he cou'd not have the features and wooly hair of a black. Besides, the mother who was before delivered of a *mulatto*, a child between a black woman and a white man, wou'd not conceal the father of her second child, for the *Negress's* look upon it as an honor to have commerce with a white man, and they never omit boasting of it.

In some voyages to the coast of *Africa*, there is mention made of a colony of some white men, that live among the blacks ; it is further observed, that they are weak fight- ed, and for that reason never come out but at night ; the blacks do not look upon them as men ; they therefore pursue them as they do wild beasts ; this child seems to have some resemblance to those men : what seemed to confirm this conjecture is, that some old blacks brought from the coast of *Guinea*, related that they saw several white children in their country, where the white men never go ; but that their chief had them all immediately put to death ; it is easy to conceive how an *African* white might meet with

a *Negress* in *Africa*, but the difficulty will be to find such a one in *America*; it is true that some pretend there are those kind of white men in *America*; but who has seen them?

In 1744, the child of a *Negro* and a *Negress* about 5 years old, and born in *Macondi* in *America*, was brought before the academy; this like the former was perfectly white, with all the features of a black, all to his wooly hair and eye-brows, which were white: his eyes likewise constantly rolled in their sockets, and by exposing them to the light in a certain manner, the pupil appeared of a bright red, as did the *choroides*, he is weak-sighted like the other, the skin of his hands is rough, but smooth elsewhere; several travellers relate that there is an entire nation of such white men not far from *Mexico*, who cannot bear the full light of the day, without great uneasiness: the only difference is, that in the place of a wooly hair, they have a natural, tho' white hair.

M. *Cossigny*, correspondent of the academy affirmed, that in the island of *Madagascar*, there was a colony of those *white-men*, with all the features of the blacks, but with hair like the Europeans.

The sudden effect of the cold air on a stubborn dry cough. 1737.

M. *Martin* of *Lusanne*, writes that he was
greatly

greatly afflicted for the space of 60 hours with a violent dry cough, which withstood all he cou'd do for it: as he apprehended the seat of his complaint was in the upper part of the *trachea*, and believing it was owing to a relaxation of the vessels there, he conjectured that going into the cold air wou'd probably brace up those relaxed vessels; it was now the month of january, which is always cold in *Switzerland*. The success that attended plainly shewed that he guessed right; he was not long in the air, when he found present relief, and was cured*.

Vomiting occasioned by a depression of the cartilago xiphoides. ibid.

M. *Martin* further writes, that a lad about 18 was subject to frequent vomiting, occa-

* Wou'd it not be more conformable to the known laws of the animal œconomy to expect this speedy relief in the like circumstances, from the cold bath, which is universally allowed to be powerfully capable of bracing and winding up all relaxed fibres and membranes? this is what I apprehend no man with so good reason cou'd expect to obtain, by exposing himself to the cold air: what *Baynard* on cold-baths, p. 243. tells us, seems to confirm this: a servant man had a severe cough for a quarter of a year, without receiving any relief from what he had taken, going over a narrow bridge, he fell over into the water covered with ice: he had a warm shirt put on, took some broth or other warm liquor, slept well that night; next day his cough was almost gone, and in a few days he was altogether free from it: there is to the full as extraordinary a case as M. *Martin's* of a young woman laboring for a year and a half under a very troublesome fore-throat, of which she got rid by once going into the cold-bath. *ibid.* p. 365.

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sioned by a blow, which had depress'd this cartilage. M. *Martin* raised it by only pressing on each side with his hands: he sensibly heard a kind of crackling noise upon redressing this cartilage. Many have doubted of the possibility of the thing, but this observation seems to confirm it.

An inquiry how far salad-oil may be depended on in the bite of the viper. 1737.

The academy appointed Messrs. *Geoffroy* and *Hunauld* to verify what the English *viper-catchers* said of the effect of salad-oil, in curing the bite of the *viper*; they had several animals bit, such as *pigeons*, *chickens*, *cocks*, *geese*, *turkies*, *cats* and *dogs*; most of them were bit in the leg.

What they first observed in the part bit, were two little red holes and sometimes blood; soon after a tumor appeared, which in a very short time extended itself to the thigh and belly, both becoming of a livid color: the animal began then to vomit, had convulsions, death soon closed the scene; the fowl stretched their neck, as if to vomit; and some kind of humor came out at their bill; the *vipers* they made use of were vigorous and strong, they seldom employed them twice to bite any of the animals; the effect of the poison of the *viper* is a gangrene, which soon reaches up to the heart.

By

By the several experiments they made, they are of opinion that this chaffing the part bit with warm oil, is not much to be depended on; for some of the animals bit recovered, who had no oil rubbed on, and several died, tho' they had been rubbed with the oil as directed: they made further experiments, they mixed $\frac{1}{4}$ of the poison of the *viper* with the oil, and dropped it into some incisions they had made; the oil in this case did not prevent the effect of the poison, for upon dissecting the animal after, the cellular membrane was found gangrened, and full of a redish *serum*, especially in the abdomen, while the cellular membrane of the *thorax* and buttocks was intirely empty: there appeared neither inflammation nor gangrene in the stomach, tho' every one of the animals bit had an inclination to vomit, and many did vomit, nor did the brain or *medulla spinalis* appear in the least altered, nor was there any congealed blood to be seen, it was rather fluid; the arteries were empty, while the veins were full of blood, which remained fluid a considerable time after the death of the animal; and the few clots of blood, which were found in the auricles and ventricles of the heart, had no consistence.

These gentlemen also related the case of two apothecaries boys, who were accidentally bit by *vipers*. One had 12 or 15 scarifications

fications made on the part and on his arm, eat the *viper* broiled on the coals, and washed it down with a good bumper of wine, in which was dissolved a strong dose of Venice treacle, and spirits of *Vipers*. The bit-finger was dressed with compresses dipped in brandy. As his fore-arm began to swell, he had 20 scarifications more made; he took some broth with *Viper's salt*, and was scarified in the wrist, he drank from half an hour after 11 at night till one, about a bottle of the best burgundy. The patient slept after till 6 in the morning, when to the surprise of those present, he was perfectly free from all complaints.

The other happened to carry some *Vipers* to an English gentleman's lodgings to make *Viper-broth*, he was bit in the finger; the first thing he did was to cut off the head of the *Viper*, and crushing it after, apply'd it to his finger. As he perceived a very acute pain, he had a string tied tight about his finger, he attempted in vain to scarifie it, having no other instrument but a wretched bad pair of scissers, he requested the gentleman to do it for him; but this gentleman dissuaded him from it, and as he had some knowledge in the practice of physic, he advised the lad to rub in some of the *Viper's grease* warm, which he assured him wou'd prevent the effect of the poison, he further added

added that he had often seen the mountebanks in *London* and other towns ordering some of their servants to be bit by a *Viper*, and that all they did was to take a dose of Venice treacle, and chafe the part with *Viper's grease*, and that they were perfectly well by the next morning. The lad took this advice, killed 3 or 4 of his *Vipers*, had their fat melted, and well rubbed into his hand and arm, which by this time were considerably swelled, he took besides 3 drachms of Venice treacle, washing them down with a glass of wine. In full confidence of the effect of his *Viper's fat*, he returned home, but he soon perceived the bit hand and arm were considerably swelled, the other hand swelled likewise, he was obliged to take the buttons out of the wrists of his shirt, and rip open his waste-coat sleeves. By the time he got home, he felt a violent heat all over him, he notwithstanding had a cordial draught made of treacle and milk-water of each 3 ounces, Venice treacle half an ounce, camphor a dram, volatile salt of *Vipers*, salt of *amber* and *sal ammoniac* of each 8 or 10 grains, *sal volatilis oleosus Silvij* half a dram. He was put to bed, and took after much such another draught. He complained of a great heat in the *æsofagus* and *thorax*, and had very great difficulty to speak; he was hereupon let blood in the other arm, 6 cups

of blood were taken from him. As soon as his arm was tied up, he fainted away, and vomited for near $\frac{3}{4}$ hour; after this his finger was scarified, but no blood wou'd come. They had the whole hand and arm chafed, as also the region of the heart with a mixture of compound spirit of lavender, camphor, treacle and *Viper's grease*, which gave him present ease. His cordial was repeated, and about 8 in the evening he had another cordial, after which he slept till 4 the next morning. When he awoke, he complained of great thirst, and great confusion in his head; they then gave him a good large glass of wine; he lay quiet for half an hour after. About 7, he eat very heartily the leg and breast of a poulet. The swelling that remained was removed with proper liniments. The arm was in some places black, in others of a violet color, but these discolorings soon disappeared, the lad did perfectly well after.

The English *Viper-catcher's* case was much more extraordinary, and had like to prove fatal, by his delaying too long the chafing the part with the oil. For he was bit an hour and a quarter before he wou'd apply the oil, he had cordials given him, but he did not perceive they did him any service, he found more relief from a cup or two of oil he took. After he was put to bed, he complained
greatly

greatly of his back and belly; his wife being directed to chafe those parts with some of the same warm oil, he found present relief, as if it had been a charm that had been applied. He soon after fell asleep, and slept till about 6 the next morning, and found himself perfectly well. But having drank too freely in the afternoon, the swelling and pain returned, he had cold sweats, but all these appearances were soon removed, by chafing with oil, and lapping the arm in whited-brown paper, wetted with some of the same warm oil. What is pretty remarkable in these 3 cases is, their symptoms were nearly the same, and disappeared nearly in the same manner, by long and sound sleep; they all took cordials, two of them had been chafed with the oil; so 'tis hard to say whether the oil, or the cordials should have the merit of the cure.

It is well known that the poison of the *Viper* begins first to display its parts in the cellular membrane, which lies under the skin, and is always full of fat, the oil of all animals. Now, it is difficult to conceive, if oil or grease be the proper antidote against the poison of the *Viper*, how it comes, that the fat in the cellular membrane does not prevent this poison's displaying its parts in the very magazine of the fat of all animals? Surely if the exterior application of oil is

able to inviscate this poison of the *Viper*, the innate animal oil shou'd more effectually inviscate this same poison, and never suffer it to produce so sudden and considerable a gangrene in the very middle of this animal oil? as some died who were chafed with oil, and others escaped, tho' they were not chafed, so those gentlemen think this chafing with oil is not to be depended on.

Surprizing success of volatile spirits in the bite of the Viper. 1747.

As M. de *Jussieu* the younger was herboring in the *Environs* of *Paris*, according to annual custom, attended by the students in physic; one of them took hold of a *Viper* he had mistaken for a snake (a harmless amphibious animal very like a *Viper*, common about ponds, &c.) which bit him in two places in his right, and in one in his left hand. When *de Jussieu* had seen the animal he knew it to be a *Viper*. The instant the young lad was bit, he felt a numbness in his fingers, which swelled so as to prevent his bending them. He here began to be alarm'd, but M. *de Jussieu* assuring him he was in no danger, he began to pluck up his spirits. M. *de Jussieu* had well known before, both from reason and several experiments made on animals that volatile salts were a sure medicine to stop the progress of the poison of the *Viper*, provided they were early enough apply'd

ply'd; and having by good fortune a bottle of the *Eau de Luce* about him, which is known to be no more than a volatile alkali impregnated with oil of *amber*, he gave the patient 6 drops in a glass of water, and dropped some of the same into each of the wounds. It was now about one, and very warm (23d *July*). About two he complained of a sickness at stomach and fainted, but by taking a few of the same volatile drops in a glass of wine, his faintings left him. He was conducted afterwards to a lodging, and after he had been put to bed he grew sick, vomited up his dinner, but by taking more of the volatile drops he found ease, was quiet, and slept. M. de *Jussieu* returning from herborizing about 8 in the evening, found him a good deal better, he complain'd only of the violent sweat the drops had thrown him into. He passed a comfortable night: but as his hands were swelled, they were chafed with olive oil, into which some of the same volatile drops were put. The effect of this application was very sudden, in half an hour after, he cou'd easily bend his fingers. He dressed himself, and after a hearty breakfast, returned to *Paris* as well as ever.

Extraordinary effects from eating the roots of Henbane. 1737.

M. *Patouillat* physician at *Toucy* being called to a cottage near that place, was greatly

ly surprized to find 9 persons, a whole family except the man of the house, with the symptoms of being poisoned, after eating the roots of henbane in their *soupe*, which they mistook for parsnips. The man of the house happened not to be at home, so he eat none of these roots. The wife was 5 months gone with child. She had 5 boys of 2, 9, 12, 14 and 18 years old, and 3 grown up girls of 15, 17, and 19 years old. Some were both speechless and senseless; and all the signs of life they gave was by hideous howlings, shocking contortions of their limb, *risus sardonius*. All of them had their eyes starting out of their heads, and their mouths drawn backwards on both sides. If some of them did speak, it was to foretell some evil that was to happen. One in particular said her neighbor wou'd lose a cow; another said the 6 *livre pieces* wou'd be reduced to 5 *livres*. One had so strong convulsions that he was obliged to be held by 4 strong men, while the doctor was endeavoring to pour down the antidote (*theriaca*). Another broke loose, and ran into a pond about 100 paces from the house, where he narrowly escaped drowning.

He gave emetic tartar to the boys in so large doses, that the eldest took 45 grains, and the others in proportion, except the child of two years old, to whom he gave the *theriaca*;

theriaca, as also to the mother, in a triple dose, as he did not think it safe to give her a puke, on account of her pregnancy.

The girls took 4 ounces of the *theriaca*, besides salt of rue in warm milk. By the next morning they all had recovered their senses, but remembered nothing of what happened. All this day they saw every thing double; the 2d day they saw the objects single, but they appeared as red as scarlet, but on the 3d day this symptom also gradually left them. Since that time they perfectly recovered.

M. *Bertrand* of *Marseilles* writes that a whole community of friars in *Provence* became even more frantic than the preceding family, after eating the leaves of henbane in a salad.

Death occasioned by swallowing a bit of hemp stalk. 1738.

M. *Vacher* informed the academy, that a heal strong woman of 57, as she was hackling of hemp, happened to swallow a bit of the stalk: she perceived nothing at the time, but soon after she complained of a cough, which became very painful, attended with great difficulty in breathing or speaking, she always felt an irritation in the *trachæa*. She died in less than 3 days: when she was opened, the bit of hemp-stalk was found lying cross-ways in the first sub-division of the *trachæa*;

trachæa; by the irritation it occasioned, the lungs were greatly inflamed, all the rest of the body was sound.

Sudden dumbness upon the retention of the placenta. ibid.

The Comte de Bievre writes, that a poor woman in a village in Berry was brought to bed in 1737, but that the after-birth did not come away; in a few days after she lost her speech, the after-birth still remaining; yet she recovered her health, so as to be able to attend her domestic affairs: about a month after, some dispute arose between her and her husband; in the violent passion she then fell into, she recovered her speech to scold him; ever since she has spoke as freely as ever, tho' the after-birth still remains in her body.

It is not easy to conceive how this woman upon the retention of the *placenta* cou'd lose her speech.

Extraordinary appearances from impressions made on the tongue. 1740.

As M. Kostremski a Pole, was at table with one M. Forst, a Swedish officer, he observed that when M. Forst eat any thing that was either salted or high seasoned, the sweat trickled down his right cheek very plentifully, tho' there was not one drop to be

be observed on the other cheek or on any other part of his body.

M. *Kostremski* put several questions to the *Swede*; but he cou'd give no other account of the matter, than that it was so, since he cou'd remember; the curious *Pole* examined the head and face, to see if there had been a wound, &c. but cou'd not find the least *vistige* of any external cause, that cou'd occasion so extraordinary a *phenomenon*, but upon examining the inside of his mouth, he perceived that about half an inch of the tongue on the right side was bare, and wanted the *epidermis* to cover the *papillæ nervosæ* in that place; all salt and high seasoned meats, by stimulating these *papillæ* of the tongue, here stripped of their covering, was undoubtedly the cause of this extraordinary *phenomenon*.

A surprising effect from an over-dose of pills.
ibid.

One *Trebot*, a husbandman near *Toulouse*, had been 2 years afflicted with a cholic, violent reaching, and an insatiable appetite, attended with a sense, as if something was gnawing his bowels, voiding at one time a great many flat worms, and at other times the same rolled up in balls: in this his great misery he applied to the apothecary of the great convent at *Toulouse*, who gave him

some pills, which he was to take at certain times, washing them down with a decoction, he also gave him: the poor patient willing to get rid of his complaints, that became now insupportable, took all the pills at once; he soon after was taken so ill, as to be judged a dying, he had such faintings as made every one about him apprehend every moment wou'd be his last: all this time the growling of his guts was considerable, and might be heard at 30 paces distance; he at last began to void worms, some of them pretty long, but the last was 16 foot long, supposed to be his most cruel enemy: this worm was the most extraordinary that perhaps had been ever seen; it kept its head $1\frac{1}{2}$ foot high, whether it crept along the ground, or rolled itself up into a ball: when it was put into a bucket of water, it was seen to make some surprizing motions, always keeping its head a foot above the water; the head was as round as a pea, and in it were two eyes, the neck was short; the patient by thus getting rid of his troublesome guests, seemed well pleased with his rashness, which delivered him at once of his troublesome companions.

Ill consequence like to have happened upon swallowing a small French crown. 1740.

A poor girl at Metz bantering some of her
co-equals

co-equals about a small crown, a 3 livres piece which happened to be bigger than what are usually seen, put it in her mouth, saying it was not so big but that she cou'd swallow it; the other appearing uneasy for her crown, set the girl who had it in her mouth a laughing, by which the crown slipped into the *oesophagus* where it stuck; the next surgeon being sent for, he cou'd neither bring it up, nor protrude it into the stomach. M. du Luc, surgeon of marines being called, after a short pause, sent for two pounds of *quick-silver*, which after warming it a little, were given to the patient in a mess of broth; the *mercury* precipitated the crown into the stomach, which relieved her for the time: he had her put to bed, and directed she shou'd lie on her left side, that the *mercury* might have the more opportunity to *amalgamate* with the *silver*: 2 hours after, he ordered her to walk about, and to take 3 ounces of the oil of sweet almonds; she no sooner took the oil, than she complained of violent pain at the lower orifice of the stomach, had a great inclination to puke, accompanied with faintings: she was after well jolted in a coach, which had the desired effect, for the *mercury* began to pass; it was greatly changed in its color, owing to the *silver* now joined to it, for they passed this *mercury* thro' a piece of *chamois*, and thereby recovered a dram of

the silver. As the patient had still some colic-pains, she had more *mercury* given her, and was jolted as before; they here got as much *silver* as before. When she had voided all of it, she got thorough ease, and has had no complaints after. M. du Luc sent the above account to M. Morand.

An inquiry into the mechanism Nature employs to reunite fractured bones. 1741.

The experiments M. du Hamel made with *wood* given to animals mixed with their food, whereby he discovered that their bones became red, induced him to examine the mechanism *Nature* employs in forming the *callus* in all fractures; the general opinion is, that the reunion of all fractured bones is owing to the lymph, that oozes thro' the broken ends of the bony fibres, which cements them together, as glue unites two pieces of wood. M. du Hamel by a number of experiments he has made, discovered that it is the *periosteum* that forms this reunion. The *periosteum* begins to swell, first about the fractured part, soon after it becomes cartilaginous, and at last bony, forming round the fracture a kind of ring, by which means it fills up and connects the fractured ends of the bone together. The method M. du Hamel made use of to discover this matter was this, he had the thigh bone of several pigeons fractured; the fracture he had reduced and the

the proper bandage applied to each; these pigeons he had killed after, whereby he discovered both the mechanism, as well as the progress *Nature* made towards the reunion of the fracture. The first of these pigeons was killed the 2d day after the fracture; he found the *periosteum* had formed a soft tumor only round the fracture.

He had another killed 4 days after the fracture; the tumor of the *periosteum* was here both bigger and harder than in the first; for the inner *lamella* was cartilaginous, of a firmer texture than the exterior, which was still membranous.

A 3d pigeon was killed the 6th day after the fracture; this was an oblique fracture, yet the *periosteum* as in the former cases, had formed the same osseous tumor about the fracture, and where it had been tore, it was observed to enter between the fractured ends of the bone.

Eight days after a 4th pigeon was killed; after the *periosteum* had been removed, and even the cartilaginous *lamella* round the fracture had been dissected, the bone was found consolidated, and covered round with a bony concretion, not quite so hard as the old bone; these experiments evidently shew the gradual progress of *Nature* in the formation of the *callus*, which at this period cannot otherwise be but weak.

He had a 5th killed the 10th day after
the

the fracture, and a 6th 15 days after; the same progress in their ossification was here more visible; the tumor the *periosteum* first forms round the fracture, decreases in proportion, as its fibres become bony, so as at last to disappear quite, leaving a bony ring round the fracture.

M. du Hamel to satisfy himself that the reunion was not produced by the lengthening of the broken bony fibres, sawed one of the above united bones lengthways, where it was visible the fractured ends of the bone contributed nothing to the *callus*; for they were found united by the above bony ring.

M. du Hamel confesses he owes this discovery, concerning the reunion of the bones, to the observations he made upon grafts and fractures of trees and their manner of uniting; he always found it was the bark, and not the lignous fibres that filled up, and united the broken fibres of the tree; and that to regenerate those fibres it was as necessary to protect the graft, or fractured tree from external injuries, either too hot or too cold air, as the fractures of animals from the same.

Comparative anatomy has always been of infinite service in discovering the true use, structure and mechanism of the human body; we here find the knowledge of the structure of vegetables is no less conducive to
the

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the same end, so great an *analogy* is there found to subsist between animal and vegetable substances.*

Odors how speedily communicated. 1743.

It wou'd undoubtedly be very curious to discover those tubes, which so suddenly convey those odors. There are number of instances, where these odors are as it were in an instant communicated from one part to the other. Sir *Hans Sloane* observed, that by putting a little of the rosin of the wild *pine-tree*, which grows on the borders of the *Mediterranean* near *Montpelier* on his tongue, he perceiv'd in a moment after that it had given his urine the smell of violet flowers. Upon his communicating this surprizing effect to M. *Cowper*, he in return acquainted sir *Hans*, that being called to an apoplectic who died in a few hours after with a

* What M. *Vacher* discovered in 1746 upon dissecting the *craniums* of two men, who some years before had been trapaned seems to confirm, that this reunion is not owing to the lymph, oozing thro' the broken ends of the bony fibres, but rather to the *periosteum*, which here also united and filled up the hole; the hole in the inner table of both *craniums* was as open as if the operation had been performed but the day before, but the *periosteum* had filled the hole in the outer table, and closely adhered to the bone every where.

Explanation of Pl. vii. fig. 1. letter A shews the *periosteum*, where it begins to form the *callus*. fig. 2. shews the bone sawed length-ways. A. the *callus*. fig. 3. shews the ends of the bones do not contribute to form the *callus*. A the *callus*. The other figures shew the different ways those bones, when left to themselves are united.

clove

clove of garlic in his mouth, he sensibly perceived in every part of his body, which he dissected after, a strong smell of garlic, tho' he was sure the clove of garlic went no further than his month.

Uncommon effect of fear on the body. 1744.

It is a common received notion that when a person is seized with fear, if a vein was opened, the blood wou'd not flow. M. *Courtivron* informed the academy of a fact, that seems to contradict this general notion : a deserter had been threatened to be sent to his regiment ; he was suddenly seized with fear, and was taken very ill : there was now all pains imaginable taken to persuade him he had been pardoned ; during this fright he had been let blood, the vein was no sooner opened, than the blood spouted forth with great impetuosity, and continued doing so during all the time he kept a bleeding.

A very extraordinary metastasis of the gouty humor. 1747.

A heal, strong man about 56 began to feel some twitchings of the gout by intervals ; after this he became so sensible of the least change in the weather as to be obliged to have fires even in summer ; he all of a sudden and without any visible previous cause, began to make a whitish urine, which surprized

prized him a good deal, but was more so, upon finding that this urine in about an hour after, recovered its natural transparency, after it had deposited a sediment a quarter of an inch thick, which was soft at first, but in two hours after, it became as hard as *plaster of Paris*. He continued discharging the same kind of urine for 8 or 9 months, without perceiving the least inconvenience from it; during which time he computed he had voided 70 pounds of the above gypseous matter, enough to form his statue.

About 9 months after he happened to change his lodging, and from the first night he lay in his new lodging, he never after passed any more of his gypseous urine, and yet he never perceived the least change for the better or for the worse in his health after. What connection cou'd this man's changing his lodging have so as to suppress his gypseous urine? M. *Bose* sent the above account to M. *Reaumur*.

A very extraordinary effect of the cortex. 1748.

M. *Bouwart* being called to a man, who had a dry *gangrene* in his foot, ordered him the *cortex*, which soon brought on a suppuration round the mortified part; what is here extraordinary is, whenever the patient left off taking the *cortex*, the suppuration wou'd cease, and he was then worse; but

upon his re-taking the bark, all was well again ; and by persevering in its use, he perfectly recovered : this alternation of better and worse upon taking or discontinuing the *cortex*, seems to confirm its being as great a specific for stopping the progress of mortifications as for curing agues*.

* We find nearly a similar case in the *Phil. Trans. abrid.* vol. vii. p. 645. a man about 50 had a mortification on the back of the foot ; he was ordered to take $\frac{1}{2}$ dr. of the *cortex* every 4 hours ; when he took it but every 6 hours, the fever returned, the sore grew then worse, but upon taking the *cortex* every 4 hours, all was right again, the fever quite left him, the sore healed soon after ; the *cortex* probably produced all those good effects by taking off the fever, which always attends wounds and ulcers more or less, and which for the time is known to prevent suppuration, on which the happy issue in these cases depends, and that by over-distending the capillary lymphatic arteries in the lips of the wound or ulcer, to remove which surgeons are obliged to have recourse to copious bleedings, emollient fomentations, lenient potions ; when therefore the fever is taken off, *Nature* left to herself, procures a laudable suppuration. It was very natural to infer from this known effect of the *cortex*, that it wou'd assist the maturation of the crude pustules in a confluent pock ; it accordingly was found, not only to promote the maturation, but even change or totally banish the *petechiæ*, and stop the hemorrhage or flux that often attends this kind of pock ; it was found rather to promote than suspend the ptyalism, which is always salutary, and after a few takings, remove the sore throat, rendering deglutition easy ; as the extract sits lighter on the stomach ; a scruple is ordered to be taken every 3d hour, acidulating the patient's drink with ol. vitriol. in bloody urine, alum is added, V. G. R. Extract. cortic. Peruv. unicum semis, alumen. Scrupul. duos, Aq. Cinnam. Simplic. unc. 7. Syrup. Cydonior. unc. M. cap. cochlearia duo altern. hor. Where alum disagreed, it was changed for Japan-earth.

It may be given to children by way of clyster with milk, adding diascordium if necessary. *Phil. Trans. abrid.* vol. xi. p. 1037.

A most

A most extraordinary case where neither the pulse nor the beating of the heart cou'd be felt.

1748.

M. Berryat, physician at *Auxerre* writes, that there was a gentlewoman in that town, who in her perfect health had neither pulse, nor motion of her heart in any way discernable : he adds, this had imposed on some physicians who attended her in some former illness, as looking upon her case to be desperate, tho' in effect it was but slight, and out of which she very easily recovered ; what is still very singular, even the most violent fit of her fever does not render her pulse, or the beating of the heart a whit the more sensible : this lady never has any color, nor was she ever regular, as to her *menses*. In 20 years marriage she had but one boy, which is now a poor *meagre* thing, appearing not to be above 5 or 6 years, tho' he is 15 or 16 years old.

M. Berryat conjectures, that this extraordinary case is owing to the ventricles of the heart's being considerably less than what is natural ; as the heart cannot receive a sufficient quantity of blood to distend the arteries, their pulsation must of course be imperceptible, the circulation in such a case must be languid, little or no blood will be propelled into the capillary cutaneous arteries, whence very little color to be expected :

the general coldness the lady feels in her extremities, her having her menses so sparingly, and the frequent returns of her fever are easily deducible from this preternatural state of her heart.

A very uncommon disorder of the eyes. 1749.

The same M. *Berryat* writes, that there was a young lad at *Auxerre* who had always tender eyes; both pupils were *eccentric*, being situated at the upper part of the *iris*; he all of a sudden complained of a mist before his eyes, which prevented his seeing the letters: finding this to continue, he consulted M. *Berryat*, who at first discovered no other ailment than a slight *ophthalmia*; but this cou'd by no means be the cause of the dimness the patient complained of, especially as the *cornea* appeared without either speck or blemish; but upon closer inquiry a solid, round, transparent body was discovered floating in the aqueous humor. M. *Berryat* ordered only what was proper to discuss the inflammation: the patient's affairs requiring his going to *Paris*, he there consulted M. *Ferrein*, who readily discovered that the above round, solid body was the crystalline, which had quitted its socket and passed into the anterior chamber of the eye; the preternatural situation of the pupils of both this young lad's eyes obliged him to strain

strain a good deal to read, which probably is what dislodged the crystalline, and forced it after into the anterior chamber, where by the contraction of the *cornea* it appeared almost immoveable; upon this lad's return to *Auxerre*, the crystalline of the other eye began to quit its socket likewise. M. *Berryat* to prevent the inflammation the former eye was now threatened with, ordered a proper regimen, and a blister to the back: by these means this eye recovered its sight; by this time the crystalline of the other eye had fairly quitted its socket, and passed into the anterior chamber.

Now both eyes were afflicted with the same disorder, but by observing the same regimen and repeating the blister, both crystallines began to recover their transparency; they likewise were so far diminished as not to intercept the rays of light; the patient cou'd therefore see, but with this very singular circumstance, that his sight was always worse in the clear sun-shine: however, upon the patient's neglecting to repeat the blister, and exposing his eyes too much one day to the strong rays of the sun, he brought on such an inflammation on his right eye, as eluded all means employed to discuss it; so he lost the sight of that eye intirely: the crystalline in 8 days time became quite opake, and swelled so as intirely to fill up the anterior

terior chamber ; the left eye happily escaped : he can read with it the titles of books without spectacles, and in general all large objects, provided they are not situated in too glaring a light ; but cannot at all see small objects. This case merits so much more our attention as it is the first of the kind hitherto observed, it is therefore proper to know that such cases are possible.

An inquiry into the effects of the electric matter on human-bodies. 1749.

There is scarce any subject in natural philosophy that has of late given occasion to the making so many experiments as *electricity* ; the antients had well observed that *amber*, when well rubbed wou'd attract bits of straw, and such other light bodies, on that account they called it *electrum*, as believing the property of attracting such light bodies was peculiar to *amber* ; but it is now well known that a great number of other bodies are endued with the same property. Some bodies need only to be well rubbed, either with the hand, or with paper to be able to produce this *electric* property ; all such bodies are said to be *electrics per se* ; other bodies are called *non-electrics*, that is, they do not contain this *electric* property, but acquire it by communication or emanation from a body that is *electric per se*.

For

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For upwards of 30 years past the learned both in *France, England, Holland, Germany* and *Italy*, have vied with each other in their researches into the nature of this *electricity*.

Messrs. *du Fay* of the Royal Academy, and *Gray* of the Royal Society, have in a more peculiar manner pushed this matter very far, by communicating their discoveries to each other, and verifying them respectively, by a kind of concurrence of friendship and emulation, whose polite and uncommon unanimity has done as much honor to those learned men, as it has been the means of promoting this part of natural philosophy.

The *Abbè Nolet* of the Royal Academy, and professor *Boze* of *Wittemberg*, seem to succeed to those two learned men, whom they have left already considerably behind them, by the singularity as well as the number of their discoveries.

The surprising effects of *electricity* were no sooner publickly known than the curious in all parts began to make experiments, to try the effects of this *electric-matter* on both animals and vegetables: some went so far as to pretend they cou'd thereby restore life and vigor to parts that were in appearance deprived of both.

Messrs. *Morand* and *Nolet* had in 1746, began to try the effects of this *electric-matter* on a paralytic, who complained of exquisite

sive pain in one of his arms, which had been without any feeling for 13 years before, but the account lately published by M. *Fallabert*, professor of philosophy at *Geneva*, of an extraordinary cure performed on a paralytic by this *electric-matter*, excited the curiosity of Messrs. *Morand* and *Abbé Nolet*, who to verify this experiment, obtained an order from M. *le Comte d'Argenson*, minister of state, to get the proper subjects out of the *Hôtel des Invalides*.

Accordingly they began their experiments the 9th of April 1748, the paralytic parts were uncovered, each person underwent the experiment for the space of two hours morning and evening, and each part was successively touched with the *electric rod*.

One of the persons pitched upon for those experiments was a soldier of about 40, who had a *paraplegia* of the left side, in consequence of a wound he had received on the right side of his head 3 years before; he with some difficulty cou'd bend 4 fingers only of his left hand, but his thumb was inflexible.

This thumb was electrified the 9th of April in the morning, according to the direction of the extensors; there appeared instantly some twitchings and convulsive motions in those muscles, and in the afternoon, the thumb was observed to be more flexible than

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than in the morning: the 11th, the same as the preceding day; in the afternoon, a visible perspiration in the hand, but greater in the thumb.

The 12th, there was nothing more observed than what was the day before, except that the electrified arm was covered with several little red spots, not unlike flea-bites; in the afternoon, the motion of the thumb was more visible: the perspiration was now in both hands: besides, the flea-bites became little blisters, like those raised by the bite of the horse fly.

13th, Every thing the same as the day before; some of the blisters appeared full of a limpid *serum*.

15th, Nothing new appeared; he was laid aside the 16th, for upon closer examination, he was found to have *anchyloses*'s in all his joints.

The 10th of April a young man about 27, paralytic of the right side in consequence of a flash of lightning; which had burnt his left eye, was electrified; ever since the accident he complained of a constant pain in his face, but especially in the frontal *sinus*'s; his right hand and fingers were both insensible and without motion: he was electrified according to the direction of the *flexors* of the *auricularis*; those were observed to con-

tract a little, as well as those of the other fingers.

The 11th, in both the fore and afternoon, the motion of the *auricularis* and *anularis* was more visible; the other fingers were more flexible.

12th, The motion of the *medius* was visible, as was that of the *auricularis* and *anularis*; it was further observable in the afternoon, that the fore arm was covered with red spots, and was rough.

13th and 14th, The same appearances.

15th, In the morning, the *index* for the first time appeared to move; in the afternoon, the motion of the *auricularis*, *anularis*, and *medius* became more visible; the *index* and *pollex* appeared more disposed to motion, by their separating from the other fingers.

16th, In the morning, all the fingers appeared to move better than before; the patient said he felt a kind of numbness in the *auricularis*, which obliged him to keep it covered in the day-time with a muff, made of lamb-skin, with the wool on, and during the experiment with warm napkins, by which means the *electric-matter* acted more powerfully; the same appearances in the afternoon.

17th, The motion of the fingers seemed more free, especially that of the *auricularis*
and

and *index*, there was nothing new in the afternoon.

18th, In the morning, the motion of the *medius*, *anularis* and *auricularis* appeared more lively than usual ; but it was less in the afternoon.

19th, In the forenoon nothing more than on the preceding afternoon ; but in the afternoon, a motion was visible in the wrist, and greater than usual in the fingers.

From the 20th to 26th the same appearances ; the motion of the *auricularis* was rather increased.

From 27th to the 1st of May the same appearances.

The 2d of May, the patient experienced for the 1st time the *Leyden experiment*, which consists in holding in one hand a bottle of water, in which was an iron rod set upright ; the patient said he felt a very violent *shock* in his arm, but especially in his shoulder, where he had no feeling before ; the extension of his fingers was in like manner more visible than in the former experiments, where *sparks* only were emitted : the usual experiments were repeated for $\frac{1}{4}$ of an hour, and ended with the *stroke* from the bottle ; the same experiments were repeated in the afternoon, in the presence of M. le Comte d'Argenson, and with the same success.

3d, In the forenoon, the patient perceived a pricking pain in his shoulder; he had also the former motion in his wrist and fingers, and in the afternoon, the pricking was rather more sensible than in the morning; the motion of the wrist and fingers was rather greater.

4th, The same, as the preceding day; but the *shock* produced by the bottle, was rather more sensible in the shoulder, in the after, than in the forenoon: besides, the shoulder as well as the whole face was covered with sweat.

6th, The same appearances, the sweat only excepted; in the afternoon, the *shock* from the bottle was very sensible, as was the tingling in the flesh.

7th, The motion of the fingers was the same, rather a little stronger in the *medius*; the *stroke* from the bottle was rather greater than usual.

There was here a difficulty started, concerning the contraction of the tendons of paralytic persons; to clear up this point, the experiment was made on the arm of a dead man: some feeble *sparks* were emitted, but no motion did succeed: in the afternoon, same appearances, and the *stroke* as violent.

8th, Neither the *stroke* nor the *sparks* were so vivid as on the preceding afternoon; but both were a little stronger in the afternoon.

9th, In

9th, In the forenoon the *sparks* as well as *stroke* from the bottle were stronger than usual, or even than at the first time.

10th, In the forenoon, the motion of the wrist and fingers was rather stronger than on the preceding afternoon; the patient received 3 violent *strokes* from the bottle which affected his head equally as his shoulder; the same was observed in the afternoon.

11th, In the forenoon, the same as in the preceding afternoon; but in the afternoon, every thing was less; the back of the hand, and the joint of the *anularis* appeared red.

13th, In the forenoon, both the *electric-sparks* and the *stroke* from the bottle, were very weak; but in the afternoon both were considerably stronger: the same was observable the 14th and 15th days.

16th, In the forenoon, neither the *sparks* nor the *stroke* were very strong; however the motion of the wrist and fingers was greater after the *Leyden* experiment than after the usual *electric-sparks*: in the afternoon, no new appearance.

17th, The usual experiment by emitting *sparks* was laid aside; the motion of the wrist and fingers, occasioned by the *stroke* from the bottle was stronger, but less considerable than usual in the shoulder; in the afternoon same appearances.

18th,

18th, 19th, 20th, the same appearances.

21st, In both the fore and afternoon the *stroke* was rather greater.

22d, This *stroke* was stronger than usual, as well as the motion of the wrist and fingers, which continued more or less the same to the 28th in the forenoon; but in the afternoon of the 28th, the same *stroke* was very violent, and a more than ordinary motion was observable in both the wrist and fingers.

29th, Every thing the same.

30th, The *stroke* was visibly weak, yet the wrist and fingers were observed to retain different motions.

31st, Tho' the *stroke* was not very considerable, yet the motion of the wrist and fingers was stronger than in the preceding afternoon; in the afternoon of this same day, the *electric-stroke* was still weaker, as was the motion of the wrist and fingers less vivid or lively.

All the above motions were far from being voluntary, they were the effects only of the *electric-sparks*, and lasted only while those *sparks* were emitted; the patient was observed to move his fingers, as if he was playing on a *harpsicord*; he would likewise bend the wrist; but as all the foregoing experiments did not appear to restore voluntary motion, the patient grew tired, and it
was

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was with some difficulty that he did undergo them the last days.

But upon being often asked whether during the time he was in experiment, he perceived any alteration in his night's rest, in his appetite, and other natural functions, he answered in the negative: this patient underwent the experiment in the whole 50 times.

Another aged 48, paralytic of the left side for 7 years, underwent the same experiments.

The 16th day of April, he was electrified in the afternoon for the first time; it was here observable, that the motion of his fingers was more visible than that of either of the former: the heat of the same was more sensible.

The 17th, the same as the preceding afternoon.

18th, In the forenoon, the motion of the fingers was more visible than before, especially in the *anularis* and *auricularis*: the patient said, that from the 17th to the 18th, he sensibly felt pain in his whole arm: in the afternoon the same, rather stronger in the *extensors* of the middle finger: besides, the whole fore-arm was covered with red spots and blisters, larger than those of the former patient.

19th. In the forenoon, the patient thought
he

he felt some motion in his thumb, as if it wou'd extend itself, and the night before he also felt some pain in his knee; the motion was the same, during the experiment; in the afternoon, the contraction and extension of the wrist and fingers were more considerable than usual.

20th, The same as the preceding day.

21st, The patient had a respite this day.

From the 22d to the 28th the same appearances.

29th, Here again he had a respite of a day.

30th, The same appearances as before.

1st May. The motion appeared rather stronger in the after, than in the forenoon.

2d, In the forenoon, the patient for the first time experienced the *Leyden experiment*, wherein he said that he felt a more considerable *shock* in the paralytic than in the well arm, which held the bottle; this was visible, by the involuntary motion of the paralytic arm; after this *shock*, he was electrified in the usual manner for $\frac{1}{4}$ of an hour; the experiment with the bottle was repeated with the same success; the same experiments were repeated in the afternoon, in the presence of M. le Comte d'Argenson, and with the same appearances as in the forenoon.

3d, In the forenoon, the agitation in the paralytic shoulder was more considerable, and

and even the *strokes* were more sensible than usual; he had a respite this afternoon.

4th In the forenoon, the *stroke* from the bottle, as well as the usual *electric-sparks*, had the same effects, as in the preceding afternoon, and the fingers appeared more extended in the afternoon.

6th In the forenoon, the same *shock* in the shoulder and motion in the fingers; in the afternoon the agitation in the shoulder was rather more sensible.

7th In the forenoon, the same motion in the fingers; the *shock* was not so violent, as in the afternoon, but continued nearly the same to the 15th in the afternoon.

16th In the forenoon, neither the usual *electric-sparks* nor the *commotion* excited by the bottle were as considerable as usual; however, the motion of the fingers was visibly greater, by the later than by the former; in the afternoon the same.

17th In the forenoon, the usual experiment by emitting *sparks* was laid aside, by reason the *commotion* excited by the bottle was observed to be more effectual; the same appearances in the afternoon.

18th In the forenoon, the experiment with the bottle was often repeated, the patient said he sensibly felt a tingling pain in the paralytic arm; there was nothing new observable in the afternoon.

20th In the forenoon, the *stroke* was very sensible in the paralytic shoulder; the motion of the wrist and fingers was as usual; the same in the afternoon.

21st, In both the fore and afternoon the *electric-stroke* was stronger than in the preceding afternoon.

22d, In both the fore and afternoon the *electric-stroke* was stronger than usual; yet the motion of the wrist and fingers was not more lively.

24th, The motion of the wrist and fingers was stronger than usual.

25th, Neither the *electric-stroke* nor the usual motion were so strong as those on the preceding afternoon; but in the afternoon both were very strong.

27th In both the fore and afternoon, the *electric-stroke* and motion of the *anularis* and *auricularis* were stronger than usual.

28th, Both the *electric-stroke* and motion of the wrist and fingers were stronger in the forenoon than on the preceding afternoon: but in the afternoon the *electric-stroke* was very sensible; it was observable, that in the very instant of the *stroke*, a considerable motion was visible in the *anularis* and *auricularis*; besides, some bladders full of *serum* appeared on the fore-arm.

29th, The *electric-stroke* was in the forenoon as considerable as on the preceding after-

afternoon, as well as the motion of the wrist and fingers; but the *shock* was not so great in the afternoon.

30th, The *electric-stroke* was very feeble; the motion of the wrist and fingers were nevertheless as usual.

31st, Both the *electrical-stroke* and motion of the fingers were very feeble, and continued so the 1st of June, whereon ended the experiments, for much the same reason, as in the preceding case, these experiments in no way restoring the voluntary and natural motion of the parts affected.

This patient was likewise asked, whether during the experiments he had experienced any uneasiness in his night's rest, appetite, and other natural functions, he answered in the negative; this patient had undergone the experiment 41 days.

From the foregoing experiments, Messrs. *Morand* and *Nolet* are of opinion, that there is a great abatement to be made from the marvellous accounts, published in other countries, concerning this *electric-virtue*. Most of those who wrote on the subject affirm, that the common effects of *electricity* were to accelerate the motion of the *pulse*. Was this truly the case, *electricity* wou'd undoubtedly be a powerful remedy; the above gentlemen agree, that it is possible it might have such an effect on the common people,

taken indifferently to try the experiment on, who probably were more affected by the *aparatus*, and the *phenomenon* attending the experiments of *electricity* than by the thing itself; than by any real effect from the *electric-matter*; this they think is incontestable, *viz.* if the experiment is made on a person, used to those sorts of tryals, his pulse will not be in the least altered in its motion; M. *Morand* underwent the experiment himself, and that for hours in the presence of several members of the academy; one emitted the sparks from several parts of his body, while another of the company counted out loud the 60 seconds of each minute, M. *Morand* holding the thumb of his right hand on the artery of his left hand; he counted during each minute 84 pulsations, and sometimes, tho' not often, 83 or 85 pulsations: 84 is the usual number of his pulsation, and such as he had in the like space of time before he underwent the experiment. The same experiment tryed on others has not been found to vary from this of M. *Morand's*.

A further inquiry into the power of this electric-matter on human bodies.

Electricity has of late years excited every where the emulation of the learned, and filled them with wonder, by an infinite number

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number of *phenomena*, more singular and more admirable the one than the other; the importance of the facts themselves, and the appearance of authenticity accompanying them, required that they shou'd be properly considered; and indeed, they have roused every where the attention of those philosophers, who had for any time turned their thoughts to such inquiries; for it was not well possible for a man, who had been long employed in investigating the natural causes of things, to resist his curiosity in regard to the genuine cause of *electricity*.

The *Virtuosi* have been for the most part hitherto contented mutually to repeat each others experiments; nor did they till very lately attend to its effects on living bodies, or consider how far *electricity* may simply and in itself, (by the subtilty of the *electric-matter's* pervading bodies) be able to cure, or remove diseases; all the Royal Academy has hitherto published on the subject seems to have had no other view, but mere curiosity.

The first rational step towards rendering *electricity* of any use was made by the *Abbe Nollet*, who in 1745 clearly demonstrated, that the *electric-matter* was essentially the same as that of *fire* and *light*; not as pure as elementary *fire*, by reason this *electric-matter*

matter is necessarily blended with the finest parts of the bodies that emit or contain it.

It has been early observed, that this *electric-matter* accelerated the motion of fluids in capillary tubes: from this experiment alone it was very natural to conclude, that this matter properly applied, might in like manner accelerate the motion or circulation of the sap in the plant, as also that of the humors contained in all animal tubes.

Abbè Nolet to verify those conjectures, sowed some mustard-feed in two different pots; both pots were equally exposed to the sun for two days, and watered each day alike; the 3d day, he electrified one of the pots, the other pot was in the same chamber, but out of the influence of the *electric-effluvia*; the 2d day of the experiment 3 grains appeared, and by the next morning 9 more grains appeared in the same pot; all this time, not one was to be seen above the earth in the other pot; in about 8 days all the seed in the electrified pot were above the earth, and had stalks 14 or 15 lines long, while there were but 3 or 4 to be seen in the other pot, and the stalks of those were but 3 or 4 lines long.

It was very curious to behold those little plants electrified in an obscure place, to see *luminous tufts* break forth from the extremity
of

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of each leaf, which afforded a beautiful sight to the spectator.

The like experiments have been made with other kinds of grain, and with the same success; these experiments clearly evince, that the *electric-effluvia* are capable of accelerating the growth of vegetables: it now only remained to try what effect the same *electric-effluvia* might have on animals; *Abbe Nolet* therefore chose the tamest animals, such as *cats*, *sparrows*, *yellow-hammers*, *chafinches*, *pigeons*, to make his experiments on; to avoid the objection that might be made, that the effect attributed to *electricity* was rather owing to the agitation the animal put himself in during the experiment; for the more accuracy, he weighed two of each kind of animals, electrified one, and kept the other in a cage in the same room, but out of the influence of the *electric-effluvia*; each animal was electrified for the space of 5 hours; both the electrified and the others were weighed after; the electrified animals were always the lighter of the two; those experiments were often repeated; the result was always the same: from all which it evidently appeared, the *electric-effluvia* promoted perspiration in animals. It is here worthy our observation, that none of the above animals manifested the least uneasiness during the experiments; and when all was over,

over, they fell to their food with their usual appetite : it is further to be observed, that the smallest animals were found to lose most, in proportion to their weight ; the *chafinch* in 5 hours experiment lost $\frac{1}{57}$, whereas a *pigeon* lost in the same time but $\frac{1}{48}$ of his weight.

Abbè Nolet finding by the above experiments that the *electric-effluvia* increased perspiration in animals, without occasioning the least agitation in them, made the same experiments on men, where he found, that the effect was nearly the same ; their perspiration was increased in the same manner as in the above animals, the difference being according to more or less only.

Abbe Nolet being now satisfied that the *electric-effluvia* were capable of accelerating the motion of fluids in capillary tubes, of forwarding the growth of vegetables, and increasing the perspiration in both animals, and in man, all this naturally led him to hope, that these same *electric-effluvia* might be a powerful remedy for the palsy ; what seemed to countenance this conjecture is, that warm stimulating medicines have been always known to relieve this disorder ; and as those medicines do not produce their effects, otherwise than by the impression they make on the nervous system, the *electric-effluvia* seem to have herein the advantage,

as

as they may be applied to the part immediately afflicted, like any other topical application, without affecting any other part, or fatiguing the patient.

It was with these views that the preceding experiments were made at the *invalids*; but as they did not seem to answer the first intention, the recovery of the voluntary motion of the parts affected, they were laid aside, as hath been before observed.

It is observable that the muscles in said experiments were never seen to contract, but during the time the *electric-sparks* were emitted; and even then it was evident those muscles acted rather in a passive manner, not much better than the muscles of a dead body wou'd.

It is further observable that the 3d person electrified appeared to move his fingers both sooner and better than any of the other two men; he likewise perceived the heat diffused itself more thro' the parts affected, and yet at the close the voluntary motion of his fingers was not a bit freer, or better after.

Tho' said experiments are no way favorable to the hopes people conceiv'd of the virtue of this *electric-matter*, in relieving palsies, &c. yet as they have been attended with such variations, which may depend upon some unknown circumstances, which

time only can discover, we shou'd not too hastily conclude for or against the virtue of the *electric-matter*; and here it were to be wished, that those *Italian virtuosi*, who have published such surprising accounts of the virtue of electricity had herein followed the example of the academy, never to pronounce too hastily in matters of experiments, till by being often repeated, they were found constantly the same; had those gentlemen observed this sage conduct, their experiments wou'd be found upon tryal to answer in *France*, as with them in *Italy*.

M. *Bianchi*, professor of physick in the university of *Turin*, wrote to the *Abbè Nolet*, that he purged several persons by electrifying them with some drastic purgative, such as rosin of *scammony* or *gamboge* in their hands, and had transmitted odors thro' glass tubes, and performed cures by those *electric-effluvia*.

M. *Privati* of *Venice*, published a treatise, in which he says, that the most inveterate gouty rheumatisms, sciatics, palsies, anchylosis, and several other chronic maladies might be either totally removed, or considerably relieved by the *electric-effluvia*, and that whether the *tube* was empty, or filled with the medicines proper for said disorders; he further says, that he had communicated odors thro' glass tubes, as well stopped as if *hermetically* sealed.

Doctor

Doctor *Verati* of *Bologna*, published a history of 10 considerable cures, which were effected by the same *electric-effluvia*. He also confirmed the communication of odors, and *electric-purgations*.

Abbè Nolet often attempted to repeat those experiments in *Paris*, but not being able to succeed in any one of them, from that noble ardor, that animates him in his researches into all natural science, went purposely to *Italy* to see with his own eyes, how the above *Virtuosi* made their experiments, and to discover how he came to miscarry in those repeated tryals he had made: for surely *electricity* cou'd not in *Italy* enjoy all those prerogatives with an intire exclusion to all other countries. When he came to *Turin*, he requested M. *Bianchi* wou'd let him see his method of purging by *electric-effluvia*; M. *Bianchi* repeated the experiment 3 several times on the *Abbè*, and on 5 or 6 others; some of them of the first distinction, but no one cou'd say he had perceived any difference in himself from the experiment.

Upon the *Abbè's* arrival at *Venice*, he had himself introduced to M. *Pivati*, to whom he expressed his desire of seeing, how he conveyed odors, and the virtues of medicines, by the means of the *electric-effluvia* thro' glass tubes *hermetically* sealed: M.

Pivati appointed a day to let him see his method of making his experiments: the *Abbè* found at M. *Pivati*'s a numerous and polite company, which the *Abbè* made no doubt were convened on purpose, to render his conviction the more glaring; but how much must the *Abbè*'s surprize be, when M. *Pivati* told him, in the presence of that brilliant assembly, that he did not pretend to demonstrate the communication of odors, for that he never had succeeded above once or twice, tho' he had often attempted it; he farther added, that the tube, with which he had made them experiments had been since broke.

Here *Abbè Nolet* desired to see the *intomacatores*, or the diminution of medicines *hemetically* sealed in glass-cylinders. "As to that," replied M. *Pivati*, "it has often succeeded with me," but added he, "we are at present too many; besides, the weather is too warm; the *electric-power* would therefore be too weak for the experiment;" but why did he convene so great a company?

The *Abbè* then asked him concerning the cures said to be performed by the *electric-effluvia*, and in particular about the Bishop of *Sebenico*, M. *Pivati* ingenuously confessed, that that prelate was far from being cured; but

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but still remained in the same state he was in before the experiment.

Abbè Nolet took now his leave of *M. Pivati*, but acquainted him, that he wou'd remain eight days in *Venice*, and earnestly requested he wou'd procure his best machines to repeat his experiments of the *intoxicatores*. *M. Pivati* promised he wou'd, and that he wou'd acquaint him therewith, but as *M. Pivati* never sent to the *Abbè*, he very naturally concluded *M. Pivati* had nothing more to shew him.

M. Somis, doctor of the faculty of *Turin*, who came to *Venice* soon after *Abbè Nolet* left it, writes to the *Abbé*, that having the curiosity to see the effects of *electric-purgations*, he went to *M. Pivati* on the 26th of August, and there underwent the experiment in the presence of a great number of *Litterati*, with an ounce of the resin of *scammony* in his hand, where he was electrified during the space of 15 minutes; but that he did not perceive any alteration in himself that night or the next day: he further adds, that on the 29th of said month, he returned to *M. Pivati*, where he found a polite and brilliant company. *M. Pivati* prepared what he called a dangerous *intoxicatores*, (*opium*) for this day's experiment. *M. Somis* was now electrified, as before. *M. Pivati* happened to whisper a *Spanish* officer

officer, that they shou'd soon see M. *Somis* wou'd fall asleep. As M. *Somis* overheard what M. *Pivati* had been saying, he desired to know what he had put into the tube. M. *Pivati* confessed to him, that he put 2 ounces 7 drachms of the flowers of *Benjamin*, and 2 drachms of *opium*.

M. *Somis* requested he wou'd repeat the experiment on him, and on his friend, with *opium* in their hands; to which M. *Pivati* agreed; accordingly each had half an ounce of *opium* in his hand, and both were electrified for the space of half an hour, and yet both slept neither more nor less that night.

M. *Somis* further adds, that on his return, he had a conference with Dr. *Cornelio* of *Placentia*, who confessed to him, that he often attempted to purge by the means of the *electric-effluvia*, but never cou'd effect it but once on his servant maid, who held some *rhubarbe* in her hand; but as that was the only time he had seen any such effect, he was apt to believe it might be owing to some other cause, that his servant maid had been purged.

Abbè Nolet on his return from *Venice*, called at *Bologna* on Dr. *Verati*, member of the Academy of the *Institutes* of *Bologna*, and candidly confessed to him his doubts of those pretended communications of odors, the effects of the *intonacatores*, and *electric-*
pur-

purgations. M. *Verati* assured the *Abbè*, that he had often conveyed the odor of *Benjamin* thro' a glass-tube, which he shewed the *Abbè*; the experiment was repeated in the presence of the *Abbè*; but no odor was communicated: the *Abbè* hereupon observed to M. *Verati*, that as his glass cylinder was lightly stopped with wood only, if there was any odor communicated in his former experiments, it was more probably thro' the pores of the wood than thro' those of the glass.

M. *Verati* confessed it might be as the *Abbè* said. 'I will therefore,' added he, 'suspend my judgment concerning both the transmission of odors, and effects of the *intonacatores*, till new experiments shall put the matter beyond all doubt. But as to *electric-purgations* said he, I have in my house a man and maid servants; who were purged by the *electric-effluvia*. However, I shall herein also suspend my judgment, till I have repeated the same experiments on a sufficient number of others, and those in different stations; and if what I have published in 1748, concerning those matters are not found to be true in fact, I shall chearfully retract all I have said of that matter. But as to the ten persons said to be cured in said treatise by the *electric-effluvia*, I assure you they are exactly as there described.'

Abbè

Abbè Nolet saw one of those 10 persons ; the cure performed was more according to the order of *Nature*, gradually, and not all of a sudden, as the *electric-effluvia* are supposed to effect those cures.

Upon the whole, it evidently appears, that the accounts of the surprizing effects of the *electric-effluvia*, published by the *Italian Virtuosi*, will not bear an impartial examination. *Abbè Nolet* looks upon *M. Pivati* to be a man of candor, but confesses those facts he has published do not seem to do much honour to his delicacy ; for who can believe with him, that the *electric-effluvia* will set a watch that has stopped a going, and set it to rights, when it is otherwise out of order : or who can believe that an ounce of *mercury* had totally exhaled thro' a glass tube, with which a man had been electrified ; and what is still more incredible, that his skin became of a lead color, and that the same man had after a copious *ptyalism*.

We must therefore for the present lay aside all our flattering hopes of being able to remove those rebellious chronic disorders, *palsies, sciatics, &c.* by the *electric-effluvia*.

MEDICAL ESSAYS, &c.

Of Botany.

BOTANY, or the knowledge of plants, was from the earliest times had in high esteem among all nations; the ancients believed that all the art of physic consisted in a competent knowledge of simples; for observing that most animals, from a kind of *instinct*, seek for such plants as are capable of relieving them from such uneasiness as they feel; so man, from something superior to *instinct*, has in all ages sought after the knowledge of plants, and what is more, has put great confidence in medicines taken from them. The works of *Theophrastus*, *Dioscorides*, *Pliny* the historian, and *Galen* shew, that they had cultivated the knowledge of plants, tho' it must be confessed they acquired but a very superficial knowledge of them. Even *Dioscorides*, who had applied more closely to this science, and who among the ancients acquired the greatest reputation as a *Botanist*, has described no more than about 600 plants; and what is more, the descriptions he has left us of even those are so imperfect, that it is difficult, and often impossible to know them by what he has said of them. His successors did not

improve much upon him ; they contented themselves with such descriptions as they found in books. *Mathiolus*, the commentator most in esteem of *Diascorides*, did no more ; he never was at the trouble to look for the plants in the field, in order to compare them with the descriptions his author gave of them : but as arts and sciences began to revive in the 15th century, *Botany* in like manner began to recover its ancient lustre and esteem. *Botanists* then began to range the fields, there to search after and discover such plants as are there spontaneously produced. And here they were soon put to a stand, by that almost infinite number of plants, they every instant found under their feet ; for what memory cou'd retain even the names of so many thousand different plants, much less their several characteristics ? *Botanists* were therefore obliged to find out some expedient, to fix on some method, by which they might be able to convey the knowledge of this great variety of plants, without burthening the memory too much. First then, they distributed this great variety of plants into *genus's* or classes : such plants therefore as had something common in their exterior appearance, were to be ranged under the same name ; custom has established this method with regard to the *Ranunculus's* ; but as there are

so many parts in every plant, such as the root, stalk, leaves, flowers, seed or fruit, so it was extremely difficult to hit upon such a method as wou'd comprehend those different parts under the same class. Messrs. *Gesner* and *Columna*, two of the most famous *Botanists* any age ever produced, ranged the different plants from their *resemblance* to each other in their flowers and fruit considered together, and for this reason. As the chief end of *Nature* in the production of plants is to bring forth the fruit, so the flowers for some time at least afford more fit nourishment to the fruit or seed than at its first unfolding it cou'd receive from the leaves; all plants therefore whose flowers and fruit or seed bear a near resemblance to each other, are by those *Botanists* ranged under the same class.

M. *Tournefort* herein follows Messrs. *Gesner* and *Columna*; all plants therefore whose flowers and fruit resemble each other, are to be ranged under the same *genus*; the roots, stalks and leaves are not then to be considered; but when those different *genus*'s are to be reduced into different *species*, then the roots, stalks and leaves are to be taken into consideration; so that when a plant differs from another in those 3 different parts, the root, stalk and leaves, or in some of them, then that plant is of a different

species. Tho' this method has its use, yet it is far from being exempt from some imperfections; for there are some plants that have neither flowers nor fruit or seed, visible at least, and there are some, whose seed cannot be discovered even by the microscope, to remedy this inconveniency, M. *Tournefort* has made a class for such plants by themselves: the consolation is, that the numbers of such plants are few. Again, when the flowers and seed are not sufficient to characterize a plant, he then has recourse to the roots, stalks and leaves; and when all these are not sufficient, he takes in the manner of the plants growing, or some other remarkable appearance at first view; this arrangement of plants under their *genus's*, wonderfully helps the memory; besides, *Botanists* as often as they discover any plants, whose flowers, fruit or seed differ, may now easily form new *genuses* to range such new plants under.

M. *Tournefort* by following this method has ranged all the known plants under 673 *genus's*, which comprehend above 8846 different *species* of plants, discovered either on the earth, or under the waters; so that at this day we know more *genus's*, than *Dioscorides* knew *species* of plants; but as the memory must still be greatly burthened, with so many *genus's* of plants, M. *Tourne-*
fort

fort has reduced the above 673 *genus*'s into classes; for this purpose, he considers the flowers only of the plant, supposing it has flowers, and finds that of all the hitherto known plants there are but 14 different figures of their flowers, all the above different *genus*'s are therefore reduceable to 14 classes; but as there are some plants which have no flowers, and as there must be some distinction between plants and shrubs, as well as between shrubs and trees, so he has been obliged to add 8 classes more, which in the whole make 22 classes; so now it is sufficient to retain in the mind 14 different figures of flowers, to know what *genus* such a plant is of; the other parts, as the root, stalk and leaves, will determine what *species* it is of; M. *Tournefort* chose the flowers to range plants into classes, because the fruit or seed will soon after appear to manifest their *genus*; whereas had he taken the fruit or seed to range them by, he must necessarily wait until the next year for the flowers, to distinguish them thereby. By this method the study of *Botany* is rendered *facile* and easy to the memory.

But as it was of the highest importance to the perfection of *Botany* to know exactly those plants, those ancient *Botanists*, *Theophrastus* and *Dioscorides*, had described, were it only to recover those excellent compositions

tions they cried up so much, or detect their errors ; and as the far greater number of those plants are now quite unknown to us, either because the names of most of our plants are not the same with their's, or that the culture and clime had made so great a difference in their figures, as no longer to be known by us for the same plants, so it was absolutely necessary in order to discover those plants delineated by *Theophrastus* and *Diascorides*, to range those plains of *Greece*, *Asia*, *Egypt*, *Africa*, where those *Botanists* lived, or were more particularly acquainted with ; but where to find a *Botanist* zealous enough to undertake such a journey !

M. *Tournefort*, who had before upon a like occasion travelled all over *Spain*, cheerfully offered to undertake this long and perilous journey. Accordingly in pursuance of the *King's* orders, he set out for *Marseilles* in March 1700, in company with Messrs. *Gundelsheimer*, a learned German *Botanist*, and *Aubriet* a skilful designer, appointed his assistants : and having diligently ranged all the Isles of the *Archipelago*, the borders of the *Euxine-sea*, *Bithnia*, *Pons*, *Armenia*, *Capadocia* and *Georgia*, even to *Erivan*, the frontiers of *Persia*, he returned by *Armenia*, *Galatia*, *Mysia*, *Lydia*, and *Ionia* to *Smyrna*, where taking shipping for *Marseilles*, he arrived there in 1702, loaded with the spoils
of

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of the *Levant*, their plants, having in this journey discovered 1356 new species of plants, most of which ranged themselves naturally under the 673 *genus's* he had before established in his *Inst. Ric. Herb.* for those that did not, he established but 25 new *genus's*, without being obliged to add one new class, which evidently shews the propriety of his system of Botany, where so many exotic plants so readily ranged themselves in: this made his *Corrolarium Inst. R. H.* which he published in 1703.

But as the principal end of all our researches into this science is to discover the medicinal virtues and uses of plants, M. *Tournefort* has herein also, in his history of plants that grow about *Paris*, laid down a plan towards perfecting this part, which is conformable to the views of the Royal Academy, who directed their chemist, M. *Bourdelin* to analyse such plants, as were generally esteemed the most useful: he accordingly analys'd 1400 of them; the result was, that they all yielded the same principles, viz. *phlegm* or water, an acid liquor, an oyl, and an earth: so that the *solanum furiosum*, a rank poison, yielded the same principles as the *brassica capitata*, a culinary wholesome plant. The Academy has therefore laid aside all those analyses by fire, and substituted other methods in their place, in order to discover

discover the medicinal virtues and uses of plants, and yet retain their essential salts, nearly the same they were in the plant : pursuant to this resolution of the Academy, M. Tournefort begins with the *tamarinds*.

Of Tamarinds. 1699.

The *tamarind* is the fruit of a tree which bears the same name, and is not unlike our ash-tree ; it grows in common in *Africa*, especially about *Senegal*, in *Arabia*, and in some parts of the *East-Indies*. It is also now found in some of the *American* islands, where the Spaniards have transplanted it, together with the *cassia-tree*, the *ginger-plant*, and several other usual plants. We are obliged to the *Arabians* for our knowledge of this fruit ; the old *Grecians*, even those that came after *Galen*, were not acquainted with it ; *Serapion*, *Avicenna* and *Mesué* were the first that speak of it ; and tho' *Mesue* was wrong in taking the *tamarind* for the fruit of the *wild palm* or *date tree*, it however is certain the *tamarinds* he wrote of are the same we this day know.

M. Tournefort in 1689 found the *Tamarind tree* at *Granada*, in the terrasse of the once famous palace of *Alhambra*, which the Moors had embellished with every thing convenient for life. Travellers inform us that the *East-erns* make a *beverage* of this fruit, which is
both

both cooling and laxative ; two necessary things for the well-being of the body, where perspiration is so considerable.

Tamarinds afford by their *analysis* a salt, in every thing like unto *Tartar*. 6 pounds of *Tamarinds* dissolved in 8 quarts of water, yielded 6 drams of an essential salt, but not till it stood 2 months in the vault ; and here it is remarkable that this infusion, tho' it stood 2 months never became mouldy. Why so little of the essential salts of plants are obtained by the common method is, because we do not allow them a sufficient time to deposite there salts ; for there are several plants, which like wine require, a considerable time to deposite their salts ; *Fumitory* for example, affords very little salt after evaporation, and letting it remain 8 days in a cool place to crySTALLize ; but if the juice of the same *Fumitory* had been left 6 or 8 months to crySTALLize, it would yield a considerable quantity of salt ; when therefore we would have the essential salt of any plant, we should suffer them to remain 2, 4, 6 months, according to the nature of the plant ; and to prevent these juices turning mouldy, to lay an inch thick of common oil over them ; this oil will exclude the action of the air, which would soon alter the nature of said juices.

By all the tryals made with the salt of *Ta-*
VOL. III. C c *marinds*,

marinds, it is the same of our cream of *Tartar*; it is sour on the palate. It will not dissolve in cold water, nor crepitate laid on a burning coal, much less excite a vinous smell when mixed with *lixivium Tartari*. It is this essential salt that renders these *Tamarinds* laxative; for *Manna* is known to purge much better when dissolved in *Verjuice* than when dissolved either in water, or broth; mineral acids are known to diminish the purgative quality of vegetables, whereas lemon-juice and vinegar are not found to have the like effect. The several juices proceeding from plants may be reduced to 4 classes. Sugar, all kinds of *Manna*, honey, and in short all the sweet juices of plants comprehend the 1st class. These contain the essential salt of those plants they are had from. *Mana* till 1543 was believed to fall from *Heaven*; but at this day we know it transudes thro' the branches and leaves of the ash-tree in *Calabria*, and other hot countries; the *Meliantes* affords a juice like honey, which not only to the *Hottentots* at the *Cape of good Hope*, but also to the *Dutch* there is a kind of a feast, as *M. Herman* reports. The leaves of the willow are often found in summer covered with a candied sugar: many other leaves of trees are in like manner found covered with the like, and probably it is from these sources the industrious bees collect their honey. All
juices

juices of the turpentine kind make up the 2d class; those are only a sulphur more or less inspissated in the fir tree. All such substances as exude from trees, and dissolve in water alone, comprehend the 3d class, such are *Cherry Gum*, *Gum Arabic*, *Plumb*, *Apricock* and other Gums. The 4th class comprehends all the gumi-resinous substances, such as will dissolve partly in water, and partly in spirits of wine, such are *Myrrh*, *Olibanum*, &c.

Of the Yquetaya, a Brazilian plant. 1701.

A French surgeon, who resided many years in *Brasil*, upon his return to *Portugal*, wrote to his friend in *Paris*, acquainting him that during his residence in *Brasil*, he had the good fortune to discover a plant of singular virtues, for it was a specific in *Pleurisies*, excellent in *Apoplexies*, and never failed in *Agues*: he further added, that the dried leaves of this plant deprived *Sene* of both its offensive smell and taste, without lessening its purgative quality; this alone was certainly a valuable discovery, and which hitherto had been ardently sought after, upon account of the disagreeableness of this, otherwise good purger; this same Surgeon inclosed some of the leaves of this plant to his friend, but so crushed and disfigured (perhaps not without design, having his own advantage in view

by concealing its name), that it was not possible to know it, by comparing those broken leaves with those of other plants hitherto known; but M. *Homburg*, who had some of those bruised leaves given him, to try their effect on *Sene*, by great good fortune espied some small seeds, with a part of their *Capsula*. He gave those seeds to M. *Marchant*, who sowed them in *May*, and soon after raised the plant. The first thing M. *Marchant* did was to try, if the leaves of his new raised plant had that effect on *Sene*, as was said; he was agreeably surprised to find they effectually had. Upon closer examination he soon was convinced it was a species of the *Scrophularia aquatica major* C. B. and so far like it, except what difference culture and clime might make; besides, the European *Scrophularia* had the same effect on *Sene* that the *Brasilian* had.

Physicians have always endeavored to correct the drastic qualities of some purgative plants, as also to disguise or remove the disagreeable smell and taste of others; notwithstanding all their endeavors, the odor and taste of their correctors remained with the medicine; it is quite the reverse here, the *Scrophularia* communicates no odor or taste to *Sene*, nor does it lessen its purgative quality.

M*March-*

M. *Marchant* employs it thus, he takes of *Sene* leaves and the dried leaves of *Scrophularia* of each two drams, he infuses them in a pint of water just going to boil, he removes the vessel from the fire, and when cold, decants the infusion for use. He advises to dry those leaves, first in a shade for 10 or 12 days, and to expose them after to the sun, to dry them thoroughly; by thus letting them first dry in the shade, they retain both their saline and resinous parts, with which they abound, whereas had they been first exposed to the sun, these resinous parts would in a great measure exhale with the *flegm* or water. Probably it is those resinous parts, as they exhale in making the infusion, that carry off with them the disagreeable parts of *Sene*. M. *Marchant* takes here an opportunity (and perhaps not without *reason*) to censure our *Botanists*, who with indefatigable industry travel to *Greece*, *Egypt*, *Africa*, and *America*, to discover and search for plants in those foreign countries, while they shamefully neglect to examine the plants of their own country, as if *Providence* had not supplied each country with the necessary plants for the several uses of its inhabitants; when we consider some among the many plants of our own country, we shall find they are little inferior in their virtues to those *exotics*, so much sought after, and so dearly purchased. To instance a few among

mong many, the lesser Centory, whether in infusion, decoction, extract or powder, is well known to cure *Agues*, and if Physicians had been as industrious as they ought or might be, to join with it such other medicines as they are careful to join with the *Cortex*, probably it would be found little inferior to that valuable exotic.

The *millefolium* has also been observed to be a powerful astringent in all inward hemorrhages, the *radix filicis maris* a most excellent vermifuge, *achillea arthemisiae tenui folio facie* *Lobelia* a great incider, the dried leaves are given to smoak with success in the *Asthma*, and all opilations of the lungs, and as to purgatives, the white and *damask roses*, and many others are known to be excellent purgers; since therefore we are certain from repeated experience, that our own country can supply us with plants, that are both purgative and emetic, febrifuge and diuretic, of known efficacy in *dysenteries*, *asthmas*, and are detergent and vulnerary, we are greatly to blame if we neglect to employ them, thro' an ill-timed prejudice in favor of those brought afar off; undoubtedly we should find our account in making use of the plants of our own country, which upon a fair trial would be found fully to answer every end and expectation of the prescriber, as our European *Scrophularia* has perfectly answered the

the end of the Brazilian, in correcting the disagreeable smell and taste of *Sene*.

* *The analysis of the exotic purgative plants.*
1700.

As all the views heretefore of the Academy in directing to make *Analysis*'s of plants has hitherto proved unsuccessful, M. *Boulduc* the Father has here begun upon another plan, in order to discover the component parts of plants; the method he employs is to make extracts from them by the help of both an aqueous and spirituous *menstruum*. He begins with *Ipecacuana*.

There are 3 sorts of this root imported, the gray, the brown, and the white; as their distillation afforded no satisfaction, yielding only a *flegm*, an acid liquor and little oil; he took 8 ounces of this root in powder, and with spirit of wine he obtained 10 drams of a resinous substance; and from the *residuum* which weighed 6 ounces, he got 2 ounces of a saline extract with distilled rain water. This extract was of a soft consistence, as it wanted the resinous parts, which give extracts their solidity. It is here evident that this root contains more saline than resinous parts, and whenever that is the case, water alone will

* All those *Analyses* M. *Boulduc* has made of both the exotic and European purgative plants, are here collected together, tho' read in different years.

be sufficient to extract both the resinous and saline parts. The water will soon dissolve the saline parts, the water impregnated with the salts will easily attenuate the resinous parts, and become saturated with them, so as to compose one intire mass, the saline and resinous parts of the plant. As a further proof of this, M. *Boulduc* took 8 ounces of the same root, and with distilled rain-water only, he obtained $3\frac{1}{2}$ ounces of a solid extract; from the *residuum* which weighed 5 ounces, spirits of wine could extract but a dram of an extract something like resin. M. *Boulduc* analysed the brown in the same manner. This contains less resinous parts than the gray; for from 8 ounces in powder with an aqueous *Menstruum* he could obtain but 1 ounce 3 drams of a solid extract, from the *residuum* with spirits of wine he could get but 24 grains of a resinous substance; the *cap. mort.* weighed 6 ounces.

Notwithstanding this great disproportion of active principles in both these *Ipecacuana's*, the brown is observed to be the more active of the two, which seems to form a kind of *paradox*; M. *Boulduc* conjectures that the energy of medicines is not always to be rated according to their weight or bulk, for very often those of the least bulk are found to be the most active. *Vis maxima in minima mole* is an old maxim, which holds good in many

many instances ; bodies therefore of the least bulk may be possessed of more force to penetrate, and of course to stimulate the nervous and other fibres of our bodies, so as to agitate and carry about the blood and humors with more force than others of greater bulk or mass ; this may be the case with regard to the gray and brown *ipecacuanas* ; the parts of the gray tho' larger, may stimulate less than those of the brown, which tho' less, might be more active.

M. *Boulduc* upon further trials with the brown, found means to deprive it of its emetic quality, and that by employing the saline extract only ; for it is with this root as with all other violent cathartics, such as *scammony*, *colocynth*, their drastic quality lies in their resinous parts, which always act with more violence than the saline parts ; this saline extract purged gently, and left a sensible astringent behind it, by which it becomes as effectual in dysenteries, as the root itself in powder *.

The analysis of colocynth, jalap, gamboge and black hellebor. 1701.

M. *Boulduc* analysed *colocynth* all manner of ways ; as distillation afforded no better

* Wholesale druggists, who pound a good deal of *ipecacuana*, shou'd be attentive to turn their head aside, to avoid receiving any of the powder into their nose ; for it is apt to cause an hemorrhage, and leave a violent head-ach for 2 or 3 days after.

satisfaction than that of other cathartics, he macerated it both in water and in new wine, and made an extract from it with both an aqueous and spiritous *menstruum*; 4 ounces of the pulp infused in 6 pounds of new wine, was, after it stood 10 days to ferment, distilled in BV: an ounce of an *acid liquor* came over, which retained all the bitterness of the pulp; the *residuum* yielded $2\frac{1}{2}$ ounces of a solid extract, which purged gently and without irritation at the dose of 10 grains, owing as M. Boulduc conjectures, to the essential salt of the wine, which so sheathed the volatile acrid salts in the *colocynth*, as to prevent their too great irritation of the intestines; and this he thinks shou'd direct the best correctors for all such drastic cathartics, in order to render them of more general use in practice.

M. Boulduc took 16 ounces of this pulp, and left it 15 days to macerate in distilled rain water; upon distilling it after, *flegm* only came over, which had neither taste nor any thing else worth considering, but the extract made from the *residuum* was both much clearer, and at the same time freer from earthy parts, and of a better consistence than extracts generally are, owing no doubt to the long maceration, during which, the earthy and mucilaginous parts had sufficient time to separate and subside; whereas in
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the usual way of making extracts, they have not sufficient time allowed them for that purpose. This extract weighed $2\frac{1}{2}$ ounces, it purged gently, tho' given in a small dose. Spirits of wine cou'd extract no resinous parts from it, tho' 8 ounces of the pulp yielded to spirits of wine half an ounce of an extract, the *residuum* with an aqueous *menstruum* yielded 2 ounces of a saline extract.

From all these trials, M. Boulduc is of opinion, that the best way to obtain the extract of this fruit is, to macerate it for some time in water; this maceration comes nearest to fermentation, by which means the saline parts are separated from the mucilaginous, earthy and other hurtful parts; for he often observed, that either the resinous or saline parts given alone, were always attended with great irritation, whereas when both parts were blended and mixed together, as they are in the watery extract, they work off gently.

Jalap is the root of the *convolvulus americanus jalapium dictus*. It is one of the best and safest purgers in all the *materia medica*, tho' at present too much neglected, except among *Empirics*, who often acquire both wealth and fame from such medicines: it requires no *corrector*, which can hardly be said of any other, tho' there has been many ways employed to correct it, all which rather

spoil than meliorate it ; all it wants is to be well chosen and found. However, M. *Boulduc*, pursuant to his plan, analysed it, as he did the foregoing ; he took 12 ounces of this root in powder, and with spirit of wine he obtained 2 ounces of a resinous extract : the *residuum* well dried weighed 9 ounces 2 drachms, from which by decoction in water, he got 4 ounces of a pure solid extract.

M. *Boulduc* takes care always to filtrate his infusions and decoctions, by which means the mucilaginous, earthy and useless parts are left on the filter ; his extracts by this means are pure and free from all useless parts *.

What remained on the filter when dried weighed 7 drams, so the 12 ounces of *jalap* employed yielded 7 ounces of different extracts : 12 ounces of the same root in powder yielded to an aqueous *menstruum*, and reiterated decoction, $6\frac{1}{2}$ ounces of a solid, well conditioned extract, the earthy parts left on the filter, when dried, weighed $1\frac{1}{2}$ ounce, the *residuum* in the bottom of the vessel weighed $4\frac{1}{2}$ ounces, from which with spirit of wine he got 5 drachms of a resinous extract, which with 3 drachms, found sticking to the sides of the vessel, and which the

* The method here recommended is well worth the attention of all compounders of medicines, and therefore greatly to be wished they wou'd religiously observe it.

saline parts with water cou'd not dissolve, made an ounce of a resinous extract, so that the 6½ ounces of a saline extract, contained but one ounce of resinous parts; 12 ounces of the same root with spirits of wine yielded but 2 ounces of a resinous extract.

M. *Boulduc* concludes from these experiments, that extracts required to purge effectually, and without irritation or other untoward symptoms, shou'd contain both the saline and resinous parts, for the resinous parts given alone often occasion great uneasiness, gripings, convulsions, &c. whereas the saline parts purge very little, and go off mostly by urine; but when both are blended and joined together, as they are in all watery extracts, they generally have a good effect. The saline parts both open and attenuate the resinous parts, and distribute their active parts, while they so cover them as to prevent those uneasinesses they are justly supposed to occasion, perhaps by adhering too closely to the inner coats of the intestines, thereby inflaming, and often lacerating them.

Mecoachan, both from its affinity with *jalap*, and from its coming from the same climate is here added. 1711.

M. *Boulduc* assures us, that it is a much more gentle purger than even *jalap*, and perhaps it is on that very account it is less
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often employed than it deserves, owing as he conjectures, to its being brought to us worm-eaten and decayed, whereas when sound, it wou'd purge gently and without irritation. By its *analysis*, it contains fewer resinous parts than *jalap*, but a good deal more of saline parts; 4 ounces of this root in powder yielded to spirits of wine a dram only of a resinous extract, and to water the same quantity yielded 1½ ounce of a solid extract, the *residuum* wou'd yield nothing to the spirits of wine, for as it was before taken notice of, wherever the saline parts abound, they with the water dissolve the resinous parts, forming with them and some few earthy parts, ever inseparable from them, a solid extract.

Gamboge, gummi de Goa, gummi de Peru purgans, and by way of excellence, *Succus Indicus purgans*, and lastly *Scammonium orientale*, is a gum-resin, brought from the East-Indies; but from what tree or plant is not certain; it will easily take fire, and melt intirely over it: it will dissolve to ½ in the spirits of wine, whereas it only extends on the surface of water, forming a kind of milky substance, as *scammony* is observed to do. Upon the palate, at first, it appears insipid, but soon after, it leaves a sensible acrimony and an intolerable thirst behind; it is a powerful *hydragogue* and
emetic;

emetic; and for that reason shou'd not be given, but to robust constitutions; tho' this gum is so very purgative, yet the fruit of the tree it comes from, is eaten in the country as we do oranges.

M. *Boulduc* analysed it, 1°. In spirits of wine, $\frac{1}{2}$ remained undissolved. 2°. It dissolved intirely in *lixivium tartari*; the extract made with this *lixivium* purged little by stool, but considerably by urine, whereas the extract made with spirits of wine, purged more violently than the gum itself.

This gum ground with equal parts of salt of tartar, will intirely dissolve in boiling water, all to a few terrestrial parts; an extract made from this becomes a good purger, and that in a less dose than the *gum*, but it heats more, and leaves a greater acrimony in the throat, and for that reason shou'd never be given but in pills.

Many have sought to correct the drastic quality of *gamboge*, by either vinous spirits, mineral acids, essential oils, or alkaline salts; but of all the correctors of *gamboge*, M. *Boulduc* recommends the mineral acids, or the alkaline fixed salts: he gives a simple method of correcting the drastic quality of *gamboge*, which he says, he has often experienced the good effects of; he puts his *gamboge* in powder into a clean linnen rag, which he ties well, he puts this into a loaf
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of bread hot from the oven, which he keeps in a warm place for 24 hours, he powders his *gamboge* a-new, and puts it into another clean rag and hot loaf, repeating this process 4 or 5 times, he then powders his *gamboge* and keeps it in a bottle for use; this *gum* by the above simple process, is deprived of its violent purgative and emetic qualities, the crum of the first loaves is both purgative and emetic.

Hellebor was in high esteem with the ancients in *Maniacal* and all rebellious chronic cases; they distinguished two sorts of it, the white and the black; the white vomits violently, and often brings on convulsions; it shou'd not therefore be given without great caution. The ancients were well acquainted with its violent manner of operating, as appears by their endeavoring to correct it with vinegar and honey. The black *hellebor* is much milder in its operation. He found that what came from *England* wou'd scarce purge at all, whereas what he had from *Switzerland* purged sufficiently. The former was probably spoiled by long keeping, or in its traject thither.

This root contains few resinous parts, for it yielded to spirits of wine but a very little quantity of extract, whereas the remainder with water yielded a great quantity of extract; besides, this first extract
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being purely resinous, purged little, and that with irritation, while the second from the remainder with water, did not purge at all, but was very diuretic, whereas an extract from this root made with water alone, purged gently and well; as this is generally the case, watery extracts he thinks are far more preferable, as they always contain the genuine component parts of the plant, the saline and resinous parts, intimately blended and united together. The saline parts attenuate the resinous parts, and by that means help their action, while at the same time they prevent the hurtful qualities of those same resinous parts, their adhering to the coats of the intestines, there exciting gripings and other such effects, arising from too great a *stimulus* *.

Scammony is the inspissated juice of a plant of the same name; it is a rough purger, the ill effects known to be produced by it are intirely owing to the manner it is made; for what is made from an incision in the root, is mild and gentle in its operation, but what is made from the expressed juice of the whole plant, is always rough in its operation, and the more so, when it is mixed with the juices of other plants of the *spurge* kind, which M. *Boulduc* thinks is too often the case; for he observed that some

* The root of *aconite* being very like this, was fatally mistaken for it. *Bress. collect.* 1720.

sorts of *scammony* were both more acrid and caustic on the tongue than others. What comes from *Smyrna* is not near so good as what comes from *Aleppo*; this wants no other preparation but to be well chosen and free from impurities. 4 ounces of good *scammony*, with spirits of wine, yielded 3 ounces of a resinous extract; the remainder, with water, yielded a saline extract, which purged more by urine than by stool.

As this inspissated juice contains more resinous than saline parts, so water alone will not dissolve it, unless assisted by trituration. M. *Boulduc* by this means obtained 6 drams of a saline extract from 2 ounces of *scammony*; and from the *residuum* with spirits of wine he had an ounce of a resinous extract.

With distilled vinegar he obtained 2 ounces 2 drams of a saline extract from 4 ounces of *scammony*, and from the remainder with spirits of wine, he got 10 drams of a resinous extract. This extract with vinegar is a gentle purger, given from 10 to 12 grains; but M. *Boulduc* prefers an extract made with a decoction of liquorice-root, to any other preparation of *scammony*. He boiled 8 ounces of liquorice-root in a sufficient quantity of water, so as to have 3 pound 6 ounces of a clear decoction, free from any sediment. He poured this warm on 4 ounces of good *scammony*, triturating it at the same time in a marble mortar; and by gently evaporating it

it after, he had 3 ounces 6 drams of a well conditioned extract, what remained undissolved when dry, weighed 12 drams. M. *Boulduc* to be certain how much this extract contained of that from the decoction of liquorice-root, evaporated a like quantity of the same decoction, which yielded 14 drams of an extract, so of the above 3 ounces 6 drams, 2 of them were *scammony*. M. *Boulduc* dissolved 2 ounces of salt of *tartar* in a sufficient quantity of water, and in it dissolved 4 ounces of *scammony*, all to some earthy parts, which would yield nothing; upon evaporating this solution gently, he had 5 ounces 2 drams of a pretty solid extract.

This process evidently shews, that alkaline salts will both attenuate and dissolve all resinous substances. M. *Boulduc* thinks this may challenge the preference from all the pompous preparations of the shops, for this extract contains both the saline and resinous parts, so intimately blended together as to produce a good effect, as M. *Boulduc* often experienced. It purges gently from 24 to 48 grains.

Aloes is the inspissated juice of a plant of the same name, the *aloe vulgaris*, but from what part of the plant, or how made, is not known. It should be transparent, of a bitter taste and disagreeable smell. There are 3 sorts of it in the shops; the *succotrin*, so called from the island *succotra*, where it grows in

great plenty; this is the best: the 2d is called the *hepatic aloes*, from a notion that it was good for the liver, and to help digestion: the 3d is the *cabaline* or horse *aloes*, this is the worst of all three.

The *succotrin aloes* contains one half less of resinous, and near one third more of saline parts, than the *hepatic aloes*, and on that account the *Succotrin aloes* is a much brisker purge than the *hepatic*, and always employed internally, while the *hepatic*, as containing more resinous parts, is employed externally, as a good vulnerary, and detergent in all foul ulcers. M. *Boulduc* thinks it little inferior in such cases to the natural balsams.

As the salts in *aloes* are so active as often to abrade and lacerate the tender capillary arteries of the intestines, and by that means bring on dysenteries, hemorrhoides, &c. to prevent these evils, M. *Boulduc* recommends to grind up some alkaline salt, as the salt of *tartar* with it; this salt, by intimately blending together both the saline and resinous parts, effectually prevents those complaints, which for want of such management too often attend an imprudent or too frequent use of *aloes*.

Rhubarbe is too well known as a purgative to require any farther account of it. M. *Boulduc* doubts much of its astringent quality, for by the many trials he made, and all the experience

experience he has had, he never could perceive that *Rhubarbe* left any binding quality after it. The best way of using it is in substance. Nor does he think it would quit cost to analyse it, as it contains so few resinous parts, nor does the extract with water purge so well as the root in powder; its infusion purges less, and its decoction less again. 24 grains of *Rhubarbe* in powder, purges better than a dram of the extract, or a dram and a half of it, either in infusion or decoction. The same may be said of *sene*, and some others.

We learn from this, that such purgative plants as abound in saline parts are better employed in substance, in powder, as they come prepared from *Nature*, unless some particular circumstance should require their being given otherwise.

And here we must observe, that the infusion of all purgative plants, roots, leaves, seeds, purges better than their decoction; the fire dissipates the more volatile parts, in which consist their virtues. Too long keeping will lessen the purgative quality of *Rhubarbe* in particular, and of all others universally.

Two ounces of sliced *Rhubarbe* infused in 24 ounces of water for 24 hours in an even sand heat, yielded a beautiful tincture, of a deep yellow, agreeably bitter, and a little rough

rough or astringent on the palate, and when evaporated, it yielded 4 drams 12 grains of an extract, the *residuum* well dried, weighed 1 ounce 3 drams, which by a second infusion, yielded 3 drams of a solid extract. This extract purged less than the first. The *residuum* well dried, weighed 7 drams, which by a third infusion, yielded a dram of an extract of a soft earthy consistence; the remainder, which weighed 6 drams, would yield nothing to the spirits of wine, nor did M. Boulduc find, that any of the above *residua* had any astringent quality, though he had often employed them, and given them to patients for that very purpose.

M. Boulduc employed the spirits of wine in the same manner. He infused an ounce of sliced rhubarbe in a sufficient quantity of the spirits of wine, set in a digestive heat for 24 hours; the tincture here was of a more beautiful yellow, less bitter and rough on the tongue than that with water, which clearly evinces, that the virtues of purgative plants lie in their saline parts. Upon drawing off the spirits of wine, he had a dram and a half of an extract, which looked beautiful to the eye, smelled well, and left the natural taste of rhubarbe upon the tongue; it purged gently, given to half a dram. When mixed with water, it did not turn milky, which evidently shews it contained few or

no resinous parts, but was rather made up of the saline parts of the rhubarbe, which the *flegm* in the spirit had dissolved; the remainder when dried, weighed 6 drams, and appeared as good to the eye, as it did before it was *analysed*; and was near as bitter and rough upon the tongue, and purged as well, at the dose of half a dram, as so much rhubarbe in powder would, and by infusion in water, it yielded as good an extract as the first. And here M. *Boulduc* is of opinion, that what induced physicians to ascribe an astringent quality to rhubarbe was that roughness it leaves on the tongue, and as for the *torrefaction* of rhubarbe, he thinks it an idle preparation, it destroying all its virtues, leaving only its earthy parts behind.

How rhubarbe comes to cure fluxes, dysenteries, is not therefore from any astringent quality it is possessed of, but is rather owing to its purging gently and without irritation. The enemy thus expelled, the humors that loaded the vessels being gently evacuated, those vessels now no longer oppressed, have liberty to recover their natural tone and firmness, the flux of course ceases.

The analysis of the European purgative plants, 1705.

M. *Boulduc*, pursuant to his plan, begins here the *analysis* of such of our European purgative

purgative plants, as have been always esteemed too violent in their operation, and on that account are seldom employed; whereas had their virtues been better inquired after, we should employ them with more confidence, and to as good purpose as many exotic plants that we hold in high esteem. He begins with *gratiola*.

Gratiola or hedge-hyssop, has been reputed so rough a purger, that few would chuse to employ it: yet M. B. from repeated trials, esteems it a safe and good purger; infused in milk, it becomes both a good vermifuge and hydragogue; the milk covering those acrid salts, in which consist its drastic purgative quality, and applied exteriorly, it becomes a good vulnerary.

The root in powder given to half a dram or more, is not inferior to *ipecacuana* in dysenteries; provided the disorder is not suffered to remain too long, or that the patient's strength is not quite exhausted. As it is bitter, it must be vermifuge, and as it is astringent, it must be good in both dysenteries, and all kind of fluxes.

M. B. analysed this plant several ways. He took 2 pounds of the expressed juice from the leaves and stalks, and after it was filtered and had settled, he evaporated it and had 7 drams of an extract, which readily liquified in the air, as all extracts that abound
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in saline parts are known to do; it purged from 24 to 30 grains much milder than what cou'd be well expected from so drastic a purger; it drove more by urine, scarce excited a *nausea*, much less did it ever vomit.

As M. *Boulduc* found that what remained after, was as bitter as before the juice was expressed, he naturally inferred, that it was not totally deprived of its saline parts. He accordingly took half of this *residuum* weighing $10\frac{1}{2}$ ounces, and by repeated decoctions and macerations in water, he had 1 ounce 12 grains of a solid extract, which differed from the former, made from the depurated juice, in being of a less salino-acid taste; but in return, this extract made by decoction, was both more bitter and rougher on the tongue, and purged much better in the same dose. M. *Boulduc* concludes from this experiment, that to make extracts from succulent plants, it is much better to employ decoction than their depurated juices, unless in some particular cases, where one was certain, that such juice did contain such parts as would answer this, or the other indication, or view of the physician better. He confesses that with a great many others he believed, that extracts made from the depurated juices of plants, contained all their essential qualities, but was at last undeceived by observing, that syrups made from the de-

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purated juices of peach-flowers and roses, purged less than the syrups made from a decoction of the *residuum* of said flowers, after their juices had been expressed. The reason is this, those juices abounding already with salts, are therefore less able to dissolve those in the lignous part of the stalks and leaves, but when those lignous compact stalks are permitted to macerate for some time in water, they then become so soft and open, that the subsequent decoction totally deprives them of all their essential salts. There is this farther advantage attending this method, that hereby the natural texture and arrangement of those salts are preserved, in which undoubtedly all their powers and virtues consist. M. *Boulduc* took 16 ounces of the leaves and stalks of the same plant well dried, and by repeated decoctions, evaporation, &c. he obtained 4 ounces 3 drams of solid extract, the *residuum* well dried weighed 10 ounces; from 5 ounces of this *residuum* he got with spirits of wine 25 grains of a resinous extract. His view in employing a spirituous *menstruum* was to see, if this plant contained any quantity of resinous parts; accordingly he took 16 ounces of the same dried plant, and with spirits of wine he obtained 2 ounces 1 dram of a solid extract, which is one half less than the same quantity of the dried plant yielded

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ed to an aqueous *menstruum*. The *residuum* here well dried weighed 12 ounces, which by reiterated decoction yielded 3 ounces 6 drams of a solid extract; both extracts weighed but 5 ounces 7 drams, which is but a few drams more than the same quantity of the dried plant yielded to an aqueous *menstruum*. From all which it is evident, it is not worth while to employ a spirituous *menstruum* to obtain the extracts of succulent plants, unless, as was before taken notice of, some special reason should require the resinous parts alone; but such cases must be determined by future experience.

M. B. took in like manner the dried root; $1\frac{1}{2}$ ounce of this root by decoction yielded $2\frac{1}{2}$ drams of a solid extract, which from 15 to 24 grains purged reasonably, but not so well as that made from the leaves. The same quantity of this dried root yielded to spirits of wine, 4 scruples only of a resinous extract. The *residuum* which was still as bitter as before the spirits were employed, yielded to an aqueous *menstruum* better than a dram of an extract.

And here M. B. repeats what he often before experienced, with regard to spirituous *menstruums*, that if the spirits of wine, employed in making extracts from succulent plants, was well *deflegmated*, he is certain they would extract very little from such sub-

stances, for it is the *flegm*, ever inseparable from those spirits, that first dissolves the saline parts of such plants, and this is what makes up above two thirds of the bulk of all such extracts.

Of Bryony-root. 1712.

Bryony root has a great affinity with *mecoachan*. The root is the only part now used, and even this has almost entirely lost its reputation, it however purges very smartly, and sometimes vomits; but it chiefly drives by urine, and on that account, some look upon it as a specific in dropfies. It contains no resinous parts, and in that it differs from *mecoachan*. This, as almost all other purgative plants, is much better employed in substance, in powder, than in either an extract, infusion, or decoction. But as it may in some constitutions, act with too much violence, *Boulduc* would recommend to infuse it rather in white wine than in water. A dram of the dried root is equal to 4 drams of the green. When the intention is to evacuate the waters in a dropfy, an extract made from the expressed juice answers better than what

is

N. B. Five pounds and a half of this plant when green, weighed but 16 ounces when dried. This evinces that most green plants contain above $\frac{3}{4}$ of their weight of water, which should be well attended to, especially when purgative plants are employed or ordered.

is made, either from an infusion or decoction of the same root.

Of Peach-leaves and flowers. 1714.

Peach-flowers are esteemed not only a good vermifuge, but also a good purger; those grafted on plumb-stocks are more so than those grafted on almond-stocks, plumbs themselves are laxative, the field peach-flowers are also more purgative than the garden ones. All peach-flowers contain near $\frac{3}{4}$ of their weight of water, the unblown still more than the blown flowers; it is this water that expands, and blows them. 4 pounds of the flowers distilled in B. V. yielded 13 ounces of an agreeable water both in taste and smell: the same weight of the unblown flowers yielded as much, but not near so pleasant a water. The *residuum* put into a retort in a reverberatory fire, sent over a liquor, that was both acid and alkaline; upon increasing the fire, a spirit of an obscure red color came over, mixed with some oil, part of which floated on the spirit, and part fell to the bottom.

The tincture of peach-flowers made with spirits of wine is weaker, but not so bitter as what is made with water. M. Boulduc has often experienced the good effects of an infusion of those flowers; a dram of the dried flowers, or half an ounce of the green, infused

infused over night, and taken next morning, sweetened like tea, will prove a gentle purger; this sufficiently evinces what he often before observed, that the infusion of purgative plants, contains more of their virtues than their expressed juices; for the *residuum* after the juice is expressed, is found still to contain the saline active parts, by infusing those fibrous compact stalks in water they become rotten, and easily after part with all their salts.

The infusions of peach-flowers and roses are easier preserved than their expressed juices, which soon grow sour: those infusions might be kept the year round, by first evaporating them to near one half, covering the remainder with oil of sweet almonds, which does not congeal so readily as other oils do; for should the oil congeal, the air would get thro' the crevices at those infusions, and soon turn them sour.

The infusion of the tender green peach-leaves is not near so agreeable as that of the flowers, but then it is more purgative, and like it, is given sweetened like tea; given in this manner, it is a sovereign medicine for children troubled with worms.

Of Agaric. 1714.

Agaric is a *fungus* that grows on the *larch-tree*, from which comes the Venice turpentine;

tine; this *fungus* was in great esteem with the ancient physicians, perhaps because they had not that great variety of milder purgers we are now possessed of. *Agaric* is slow in its operation, remains too long in the stomach, there creating *nausea's*, loathing to food. The best comes from *Tartary*, there is a kind, which comes from the *Alps*, the *Trentine* and other parts of *France*; what grows on the oak or beech, shou'd never be employed. Botanists distinguish two kinds, male and female, both taste sweet, but soon after leave a bitterness and acrimony behind. The female *agaric* as being less caustic, is what is employed in medicine; it is outwardly brown, and inwardly white, easily reduced to a *farina*.

M. *Boulduc* analysed it with both a spirituous and aqueous *menstruum*; 2 ounces of *agaric* with spirits of wine yielded 6½ drachms of a resinous tincture, of a most insupportable smell; one drop of this tincture let fall upon the tongue, provoked *Boulduc* to vomit, and left a loathing to every thing for that whole day. The *residuum* weighing 9 drachms, was a dirty mucilage, which wou'd yield nothing to the spirits of wine. This is the useless *farina*, or inner part, which shou'd be always thrown away; the cortical part is what gave the tincture, this part therefore, if any, is to be employed,
for

for at best it is disagreeable, causes *nauseas* and loathings.

Agaric yields no saline parts to an aqueous *menstruum*, but when the water is impregnated with an alkaline salt, it would then yield a good solid extract; here the alkaline salt dissolves the resinous, the water the few saline parts of this *fungus*. 2 ounces of the cortical part of *agaric* and $\frac{1}{2}$ ounce of salt of tartar, with water yielded 1 ounce half a drachm of a well conditioned extract, which purged better, more gently and without *nausea* than the resinous tincture. And here, as the inner farinaceous part of *agaric* is intirely usefess, whenever an extract is made from this *fungus*, the decoction shou'd be let to settle, that the mucilaginous, usefess parts may have time to subside; the clear decoction is then poured off, and by a gentle heat evaporated to the consistence of an extract. M. *Boulduc* made an extract from the same with vinegar, it only purged less than that with salt of *tartar*; by distillation it yielded a volatile alkaline salt, and very little fixed salt.

Of Elaterium. 1719.

Elaterium is the inspissated juice of the wild cucumber; it is one of the most violent hydragogues in the whole *materia medica*: M. *Boulduc* to render its operation
more

more gentle, *analysed* it all manner of ways. It wou'd yield nothing to the spirits of wine, which shews it contains no resinous parts; the little the spirit did extract was rather a saline than a resinous substance, which the *flegm*, ever inseparable from spirits, had dissolved.

M. *Boulduc* employed the decoction rather than the expressed juice, as he always found infusion or decoction extracted much better the saline parts in all fibrous compact stalks or roots than expression; as all green herbs contain more than $\frac{3}{4}$ of their weight of water, so he always dried those; from the dried root of the wild cucumber he obtained by decoction a much better extract than from any other part of it. This extract is a very good and mild hydragogue, when given from 24 to 30 grains, adding a little powder of *mecoachan* or rhubarbe and salt of wormwood, making it up into a bolus, with a little of the extract of juniper berries.

The ancients had a high opinion of this drug; some speak in a mysterious manner of it; *Diascorides*, who has given the clearest account of it, recommends to go to the places where it grows, and when it is almost ripe, to cut it into slices, which are to be laid on a strainer, placing a vessel underneath, to receive the juice; these cuttings are thrown away without pressing them, the

juice is let to settle, and the clear water is pour'd off, the *fæces* at the bottom is dried after in the sun, this is the *elaterium*.

Diascorides cautions the gatherer to turn his face aside, when he cuts the fruit, otherwise the particles that fly off will blister his face, so caustic are they : our gatherers never complain of any such ill effects, owing perhaps to the greater temperature of our climate to that where *Diascorides* lived.

In all the different methods M. *Boulduc* hitherto employed to discover the genuine purgative parts of those drastic plants, he has in the preceding memoirs *analysed*, he is firmly of opinion, that most of them wou'd have a much better, as well as a more certain effect, were they employed as we receive them from the hand of *Nature*. Even this plant, the wild cucumber, wou'd be found so, for M. *Boulduc* dried this fruit with its seed, and powdered it after ; he found it purged gently and was a good hydragogue.

M. *Boulduc* never once attempted, in all the preceding *analyses*, to obtain the essential salts of any of them, tho' most physicians imagine they contain all the virtues of those plants ; though this opinion has very great appearance of truth on its side, yet M. *Boulduc*, by the reiterated trials he made on most plants, is convinced of the contrary ; for he never cou'd find any difference
between

between those salts and tartar, they being an acid joined to some earthy and resinous parts.

The essential salts of all plants will crystalize, and let those salts be what they will, they never contain the intire virtues of the plant they are obtained from, nor the expressed juices those salts are had from. What then contains those virtues of plants? neither the one nor the other singly, but both joined together; the virtue of plants consists in the natural texture and *arangement* of their parts, such preparation therefore as best preserves this natural *arangement*, will also best contain the intire virtues of the plant; and here one may apply what the scripture hath upon another occasion. *What God has united, let no man sunder.*

R E M A R K.

Since M. *Boulduc* has wrote the above memoir, M. *le Comte de la Garay* had the good fortune to discover a more perfect method of obtaining the essential salts of plants than any hitherto employed. This nobleman from a truly primitive christian motive, had some time before converted his house into an *hospital* for the reception of the sick poor. His good lady was no less useful in her *sphere*, became head nurse to this *new hospital*. The unexpected success that attended this nobleman's care, soon brought crowds of patients from all parts, laboring under different ailments to this *new hospital*. This obliged him to seek for such remedies, as might not only more speedily relieve those objects, daily crowding his doors, but also to obtain them at the least expence; for tho' his fortune was pretty considerable, yet when he was to provide, not only medi-

cines, but food also, and all other necessaries, he soon found it wou'd not be able to procure every thing, especially for such numbers. And here, he turned all his thoughts to the vegetable kingdom, from these considerations, 1°. That all antiquity believed the vegetable kingdom afforded such medicines, as were able to subdue, and remove all the maladies, our bodies are naturally afflicted with. 2°. That all the processes of both the *Galenists* and *Chemists* ultimately tended to separate the pure from the impure, the useles and earthy from the genuine essential parts of all plants employed in medicine, all with a view to exempt the sick from both the fatigue, and often the danger, of taking the expressed juices, or other preparations of plants, whilst at the same time they pretended to preserve the intire virtues of said plants ; but considering that they generally failed in this chief end of all their endeavors, that such extracts as they made, did not really contain the genuine natural salts of said plants, and therefore cou'd not be properly said to contain their intire virtues (salt extracted from *sene* after their manner, or from *rhubarbe*, wou'd not purge, which shews these salts were some how changed from what they were in the plant they were had from), he began to consider what this cou'd be owing to : after much reflection and many experiments made with several plants, the country he lived in (*Brittany*) afforded him great plenty of, he at length happily hit upon a method, whereby he procured the essential salt of each plant, which not only retains the known virtue of the plant, but also the very color, smell and taste of the plant the salt was had from ; a discovery of the highest importance to mankind, and reserved solely for the *Comte de la Garay*, perhaps as a reward from the *author* of all good things, for his truly charitable disposition, in laying himself out for the relief of that portion of the *Lord's inheritance*, the *necessitous and sick poor*. The same good and laudable motive that put this charitable good man, upon those researches, wou'd not permit him to bury his *Talent* ; but as became a prudent steward, who manages every thing for the good of the community, and as in duty bound to increase his own revenue, by every lawful means, applied to the source
from,

from whence riches and wealth come, his *Prince*, and imparts to him the success *God* had been pleased to bless his researches into the cabinet of *Nature* with, so as to enable him to extract from the 3 kingdoms their most useful and salutary parts, their essential salts; first its true for the use of his little *hospital*; and now offers to disclose his method of obtaining those salts for the good of the whole community. He at the same time presented his *Prince* with *specimens* of those salts, obtained after his method, from several plants, which when dissolved in any liquid, manifested the genuine taste of the plant they were had from, and upon trial, were found to be as successful in those cases, the plants they were had from are known to be. A drachm of the salt extracted after this new method from the *cortex*, did in a much less time, and more effectually remove an ague than 2 ounces of the same *cortex* in substance wou'd. A scruple of the salt of *senè* or *rbubarbe* did purge both more gently, and more effectually than a drachm of *senè*, or half a drachm of *rbubarbe* in substance wou'd.

The *King*, as became a good father of his people, considering that his subjects in general might receive unspeakable benefits from such a discovery, sent the above *specimens* to the *chemists* of his Royal Academy, to verify what had been said of them: upon trial, they were found to answer every character given of them; they were found to retain both the smell and taste, as well as the known virtues of the plants they were had from.

The *faculty* of physic of *Paris*, who had received some specimens of those new salts, appointed some of her members to make tryals of them. M. *Lemery*, and those joined with him unanimously declared, that those salts sent to the *faculty*, contained all the known characteristics of the plants they were had from, that the water, or any other liquor they were dissolved in, became rather more agreeable to the palate. The salts of *Guaiacum*, of the *cortex*, of *savine* dissolved in water, rendered it very pleasant: those salts will freely dissolve in any liquid, in water, wine, brandy, spirits of wine, simple and compound distilled waters, which sufficiently proves they contain both the saline and resinous,
active

active principles of the plants they were obtained from; intimately blended together, in their natural form, without any change or alteration, as evidently appears by their retaining their native color, smell and taste.

When these same salts were calcined, they remained a considerable time in the form of a red coal, which plainly shews they contain the sulphur or bituminous parts of the plants they were obtained from.

M. *Gross*, an eminent *chemist* in *Paris*, gave it as his opinion, that those salts contained, what *chemists* always understood essential salts to be, such as did contain the powers and virtues of the plants made use of to obtain said salts, and concludes, if the plant employed is known to be stomachic, diuretic, purgative, and so of all the other known virtues of plants, as aperitive, hepatic, cephalic, sudorific, &c. the salt obtained after this new method, will be in like manner, stomachic, diuretic, purgative, &c. he confesses that the expressed juices of the inodorous plants, let the operator take what pains he will to filtrate and depurate them, do still contain a great deal of earthy useless parts; it is for this reason that patients soon grow tired of them, by reason they sit too heavily on their stomach, and as for extracts, those made after the usual manner, from bitter plants might have their use, but those made from aromatic plants, are good for little, by reason their fine essential oil, in which consists their virtues, is lost in the making them, whereas those saline extracts, made after the new method, retain all those principles in their genuine, natural form, and that in a very small compass, a thing often and long sought after, and which was never before hit upon; a thing of the greatest comfort to the sick and valetudinarian, who soon grow tired of large draughts and bolus's; lastly, those salts will readily dissolve in any liquid the patient is to take, as broth, gruel, ptisane, which renders them easy to be taken.

The *King* receiving from all parts such strong convincing proofs of the salutary effects of those new saline extracts, ordered letters patent to be expedited for the sale of them, and upon further experience of their more general use, in some time after, purchased the manner of obtaining

taining those new saline extracts, which the author has since made public; and as this treatise is not so well known here as it ought or really deserves, I thought it might be agreeable to my readers to give some account of this new method of obtaining those essential salts from plants: besides, it might excite the curiosity of others to consult this treatise, whose title is, *La Chemic Hydrolique de M. le Comte de la Garay, Paris 1745.*

This new method of obtaining those salts is by trituration in water: the author confesses he took the hint from his observing that water alone is capable of extracting the salts, from all such wood as is brought down the rivers upon great floats; for the ashes of such wood contain very little salt. He here began to consider, that cou'd he discover some expedient, whereby to immitate the rapidity of those rivers, whilst he employed the same element water, he might in like manner extract from all kinds of vegetable substances their essential salts. The manner common salt is made, by evaporation, suggested to him the method to obtain those salts, after the plants had been well triturated in water. He tells us that after 2 years reflection, he got an *Engine*, or machine made to answer his purpose, this machine consists of an horizontal wheel, with a groove in it, not unlike a lapidary's wheel; in the frame that supports this wheel are placed 3 cylindrical glass vessels, not unlike our common pickling crocks, wider in the middle than at the bottom or top, in each of those cylindrical vessels is placed and kept suspended a small mill, very like our chocolate mills; the arms of those little mills are made of thin pieces of wood, $2\frac{1}{2}$ inches long by $1\frac{1}{2}$ broad, those mills are turned round by the above horizontal wheel, so as constantly to agitate and beat about the water in an uninterrupted circular manner, the water thus constantly and violently agitated for 7 or 8 hours (more or less according to the hardness or solidity of the substances employed), intirely dissolves whatever body or substance is exposed to its action, first observing to reduce such substances into powder; not only plants, but also the minerals, and even the most perfect metals, *gold* and *silver*, will yield their salts to this *manœuvre*. The water thus impregnated with
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the essential salts of plants, &c. is set after to evaporate on china plates, placed over pots of boiling water, fixed in a laboratory for that purpose; this B.V. dissipates the aqueous parts, the essential salt remains on the plates in the form of crystals. See Plate VIII.

Of Camphorata or stinking Ground-pine. 1703.

This plant is so called from the little odor of camphor its oil exhales; it grows common by the high roads in *Languedoc*, especially about *Montpelier*. It has been long esteemed a specific in dropfies, but more for the asthma. M. *Burlet* to verify this virtue, had 60 pounds weight of it sent to him; what had put him upon these tryals was his hearing from a physician of *Montpelier*, of the great cures some *Empirics* had made with it, but concealed the plant they employed: the best manner of employing it is in ptisane, from 1 to 2 ounces are infused in a *Paris* pint of water, or sometimes in so much white wine; the tender tops only are to be used, it is also taken sweetened as we do tea; the greener it is the better, tho' it will keep the whole year round.

As this plant is both a dryer, and heats considerably, such dropfical persons as have a cough, are of a thin habit of body and thirsty, shou'd not use it, whereas in the beginning of dropfies, where the fever and thirst are not considerable, it often is attended with a good effect, especially by giving
now

now and then a purge, to assist its operation.

When the asthma is the primary disorder, the above ptisan is of singular service, and by adding 5 or 6 drops of the essence of *vipers*, and as much *liquid laudanum*, it affords present relief in the fit.

M. *Burlet* experienced this effect of it on himself; he however wou'd not recommend to employ this ptisane as long in an asthma, as in a dropsey, and even in this, its use shou'd be suspended for some time and resumed after.

When the dropsey and asthma are complicated, this ptisane must be made stronger; it generally has surprising good effects.

Both these disorders generally proceed from a disunion of the blood, as the camphorata abounds with sulphurous parts, it acts probably by uniting the blood-globules, but as this plant is known to drive powerfully both by urine and the skin, it must be useful in those disorders; from these its effects we may reasonably infer that it contains such parts as are capable of attenuating our fizzy juices, without either heat or irritation, as most purgatives or diuretics employed in the asthma and dropsey are found to do; its chemical *analysis* confirms this conjecture.

M. *Burlet* had also found, that this plant

was serviceable in all recent oppilations of the chylopoetic glands, in the *chlorosis* and scurvy, but thinks its chief virtue is in the asthma and *dropsy*; but both time and a greater number of experiments are necessary to confirm those virtues of this plant.

Of Belladonna, or Melanocerafon. ibid.

M. *Boulduc* informed the academy that some children happening to get into a garden, had eaten of the fruit of this deadly night shade, and were soon after seized with a fever, violent convulsions, and strong palpitations of the heart; they lost all knowledge of men and things. A boy 4 years old died the next morning, upon opening him, there were 3 holes found in his stomach, and in each hole one of the pippins of this fruit; the heart was livid, and not one drop of *serum* was found in the *pericardium*.

Upon relating these sad effects of this fruit, some present said, that a vegetable acid was an antidote against both the *solanum* and *stramonium*, which resembles it, and *opium*; it was likewise said, that an opoplectic was cured, by giving him a grain of *laudanum*, and that a woman tired with the length of her husband's disorder, which was a dropsy, gave him 15 or 20 grains of *laudanum*, which threw him into profuse sweats,
and

and made him make plenty of urine, by which he was cured.

But the most extraordinary effect of *opium* hitherto known happened in 1735. Some young lads at *Grand Cairo* were drinking together, and willing to humble the pride of one among them, who always boasted of his superior strength, they privately conveyed a drachm of *opium* into his glass, in hopes he wou'd soon fall asleep, and that by that means they might have the pleasure to let him see how soon he had been vanquished : but behold in a few hours after he became delirious, and down right mad, and soon after fell into a profound sleep ; his comrades came the next morning, to proclaim their victory ; but they were greatly surpris'd to find him without a pulse, all black, his mouth closed, in short a dying : they sent immediately for a priest, who was also a physician ; this man made use of the most violent medicines to no purpose, for the lad died in 15 hours after he had taken the *opium*. His arms and thighs were full of livid tumors, like wens, some as big as a child's head of 4 months, which exhaled a most insupportable stench. What is still very extraordinary, all the cats of the neighbourhood, to the amount of 2 or 300 came running to the house he lay in. Some believed they were witches ; but the door of the house was no

fooner opened, than all the cats ran to the corps, and fell a licking it, and had they not been prevented, wou'd have devoured it.

Of Camphor. 1705.

Camphor is a resinous substance that oozes from the trunk and large branches of a tree, they tell us is like our walnut-tree; it comes to us from the island *Borneo*, and some parts of *China*: the camphor is found at the root of the tree in small grains or parcels, of a white transparent color, friable, of a most penetrating smell, of an acrid bitter taste, leaving the impression of heat on the palate. It is so extremely volatile and inflammable, that it will intirely consume, when burned even on water.

The *Dutch* from whom we get it, purify it by sublimation; they melt it after over a gentle fire, and put it into moulds to give it some form. It is brought to us in round flat cakes, wrapped up in linseed, to prevent its exhaling, for it is known to lose considerably in its weight by keeping. Several European plants contain an oil, resembling camphor in its smell, particularly the camphorata whence its name.

Lavender, rosemary, thyme, southernwood, afford an oil, that smells like *camphor*. Some eastern nations make *troches* with
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camphor, the fruit of *areca* (a kind of palm-tree), calcined oyster shells, cloves and aloeswood, which they chew, when they want to purge the head from *pituita*.

Camphor will not dissolve in water, nor in any alkaline spirit, but it will dissolve intirely in spirits of wine in the proportion of 2 of the spirits to 1 of the camphor; it will likewise dissolve in the oils olive and turpentine, in the proportion of 4 of oil to 1 of camphor. In the nitrous acid in that of 2 to 1, in *aqua regia* in that of 3 to 1, in oil of vitriol in that 4 to 1; the acids of vitriol, alum and vinegar wou'd not dissolve any of it.

When spirit of *salammoniac* or *lixivium tartari* is poured on a solution of camphor in any of the above spirits, it forms a *coagulum*, like butter, which soon resumes the form of camphor.

M. *Lemery* cou'd never decompose camphor, tho' he attempted it with all the above dissolvents, it wou'd always sublime and rise in substance: after he had dissolved it in spirits of wine, and set it to distil, the spirit came over first, which shews the camphor is heavier. He also found it was as heavy as oil of turpentine, but not quite as heavy as olive oil.

R E M A R K

REMARK.

As to the medical use of camphor, we must consult the *Germans*, particularly *Fr. Hoffman*, and *Alex. Tralles*. The *French* even at this day, seldom use it inwardly, from a notion of its heating quality.

Lemery confesses his diffidence of it on that very account, yet *Hoffman* in his *Obs. Chem.* tells us it was given by way of experiment to a healthy strong man to the quantity of a scruple, yet it produced no sensible heat in the body, nor augmentation in his pulse, but the reverse, rather a sensible refrigeration, especially about the *præcordia*: it neither occasioned thirst, nor increased the color of the urine, known effects of all heating medicines, taken inwardly.

Notwithstanding, *Hoffman* recommends to give it in a small dose, 2 or 3 grains at a time: he praises it highly in all disorders of the urinary passages, in a *gonorrhœa*, or beginning *lues*; he affirms, no medicine affords so present relief in the above cases, especially mixed with balsam of *cappiv*, whose virtue is thereby wonderfully increased: it has this good quality, to strengthen the tone of the glands and vessels of those parts, which always suffer more or less in them disorders. He likewise recommends it mixed with nitre in all continual fevers, pleurifies, and in all inflammatory cases, where it is found generally to relieve all the symptoms, procuring a calm sleep, and plentiful sweat, without fatiguing the patient.

Hoffman further recommends it in all putrid and pestilential fevers, given in an acid vehicle, with vinegar; he further observes, that by its antiphlogistic quality, it prevents the ill effects of the more irritating medicines, for the stranguary and bloody urine, often attending the use of *cantharides*, are sooner taken off and relieved by camphor mixed with nitre, than by any one thing besides, the great *Stahl* called it the *subduer of all inflammations*.

But *Tralles* who wrote an intire treatise on the internal use of camphor, assures us, that he has with pleasure and surprize, ‘ observed the happy effects of it in pleurifies; ‘ and from repeated proofs of its efficacy therein, that ‘ after 2 or 3 bleedings, applying topics to the part, and ‘ order-

ordering plentiful tepid diluting draughts, sweetened with honey, and some antiphlogistic clysters, he scarce ever gave any other medicine than 2 or 3 grains of camphor with 12 or 15 grains of nitre, washing them down with emulsions *ex. ol. amygdal. dulc.*

In the *Phil. Trans. abrid.* vol. vii. part 3. p. 273. there are some instances of *Maniac's* being cured, by giving half a dram of camphor morning and evening.

Craanen recommends a powder made of 12 grains of *sal-prunel*, 4 or 5 grains of *camphor*, and half a grain of *extractum thebaiaci* in a *phrensey* and madness: the same highly recommends camphor in pleurifies and peripneumonies in spirits of nitre, or with nitre itself, in *aq. Papav. Rbæad.*

Mindererus de Peste highly extols the following powder, which from its cheapness is called *pulvis pauperum*, and is possessed of uncommon virtues: sugar-candy 2 drams, white ginger 2 drams, *camphor* 1 dram, mix; the dose is a dram in any proper liquor, but most commodiously in an infusion of tansy made with equal parts of sorrel water and vinegar.

But *Riverius* thinks it too heating, on account of the ginger; he therefore substitutes the following in its place, which he affirms he had used with success in pestilential fevers.

℞ Bezoardium minerale 1 dr. *sal prunel* 1 dr. *camphor* half a dr. the dose is half a dram in *carduus-water*, or any appropriated liquor: the same recommends half a scruple of camphor, exhibited in oxycrate or plantain water 4 ounces, in vomiting of blood, but venesection shou'd precede. *Heurnius* likewise in his notes on *Hippoc. aphoris.* 50. ff. 5. recommends the following powder in immoderate discharges of the *menfes*. Henbane and poppy seeds, each a dr. blood stone and coral each half a dr. *camphor*, a scruple, mix. Dose half a dram morning and evening.

Du Verney says, he has with good success often added camphor to cordial potions in malignant fevers, to take off the head-ach. See *du Hamel's hist. of the Royal Academy.*

Werlhofius experienced the good effects of camphor in
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taking off *deliriums* in fevers, where *opium* did rather increase the evil.

Of the wild Valerian root. 1706.

Fabius Columna, a famous *Botanist*, in a treatise intituled *Phytobasanos*, assures us, the powder of the wild Valerian root is a specific in all epilepsies; for he not only had seen several cured by it, but being subject himself to epileptic fits, was intirely cured by the same powder.

M. *Marchant*, upon the authority of so learned an author, made some tryals with this root; he took care to have it gathered in March, before it shoots its stalks, as *Fabius* advises; the first M. *Marchant* gave it to, was a lad about 16, who since he was 7, had a fit every week, in which he lost his senses, froathed at the mouth, tho' each fit held him but 8 minutes; upon taking this powder, he had a respite for 18 days; but afterwards, he had 2 fits in 8 days, yet each fit lasted 4 minutes only. M. *Marchant* conjectured that the medicine had stirred up some humors, which wanted to be carried off; accordingly he ordered him a purge, which wrought him but very slightly, and for that reason, the patient had a fit 3 days after, which obliged M. *Marchant* to give him a stronger purge; in 3 days after he gave him a dram and half of this root in
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powder : this threw him into a profuse sweat, and made him void a great quantity of worms ; 4 days after he gave him another dram, which sweated him only ; he has ever since, now 6 years, enjoyed perfect health.

M. *Marchant* further informs us, that at the request of one of his friends he gave some of the same powder to another lad, of above 20, who since he was 14, had regularly every month a violent fit, wherein he lost his senses. Each fit used to last half an hour ; in the last fit he tumbled the whole length of a court-yard, 60 feet long, often knocking his head against the ground. The first time M. *Marchant* saw him was after this fit ; as his head was greatly confused, he ordered him to be blooded, and to take a dose of physic : 3 days after he gave him 2 drams of this powder, which purged him a little in the forenoon, but in the afternoon, it sweated him considerably, and made him void several worms ; hereupon the patient appeared more sprightly than usual, he gave him another dram in 5 days after, this sweated him much less than the first, but he still voided some worms ; tho' he here seemed a good deal fatigued, yet ever since, now 2 years, he has had no return of his disorder, and is perfectly recovered.

M. *Marchant* further adds, that he gave this powder both to grown up persons and children; in some it only put off the fit, in others it only lessened its violence, or abridged its duration, things not to be despised in so rebellious a malady.

Such of his acquaintance as he had communicated the good effects of this powder to, found it answered in the cases they had given it. The dose M. *Marchant* generally gave was a dram, or a dram and a half in a glass of white wine; but he recommends to bleed, puke, or give some physic before it, as some particular circumstances and constitutions may seem to require.

The analysis of some of the (hitherto reputed) marine plants. 1706.

The King this year united the Royal Society of *Montpelier* to the Royal Academy; the *analysis* of the *Lythophyton* was the first fruit of this union. M. *Matte* of that Society informed Mr. *Geoffroy* the elder, that the *Lythophyton* yielded by its *analysis* as much volatile urinous salt as any animal substance whatsoever.

M. *Geoffroy* very naturally judged that any other marine plant wou'd equally yield the same kind of salt; accordingly he got *sponge*, which when well dried and cleansed from earth, weighed 11 ounces; he put this
sponge

sponge into a retort, placed in a reverberatory fire, and distilled it by a gradual fire: he carefully separated what came over, and rectified both the spirit and salt; he had of a redish *flegm* 1 ounce, $4\frac{1}{2}$ drams, of a volatile urinous spirit $1\frac{1}{2}$ ounce; and of a volatile salt, 1 ounce $4\frac{1}{2}$ drams; besides half an ounce of a fetid oil, and as much fixed salt, which contained a little common salt; the *caput mortuum* weighed 5 ounces, which after it had been calcined, appeared to contain some particles of iron, when presented to the *magnet*. The whole obtained from 11 ounces of *sponge* amounted to 10 ounces and 5 drams, so there was a loss only of 3 drams.

This *analysis* of *sponge* compared with that of *raw-silk*, made in 1700 by M. *Tournefort*, shews, that *sponge* contains near as much volatile urinous salt even as *raw-silk*, which of all animal substances hitherto *analysed*, yielded the most of this kind of salt; 15 ounces of *raw-silk* yielded 2 ounces 2 drams of a volatile salt, and 11 ounces of *sponge*, yielded 1 ounce $4\frac{1}{2}$ drams of the same kind of salt, which is only 4 grains to an ounce less than what *raw-silk* yielded, a very inconsiderable difference.

In the *Pharmacopœa Bateana*, mention is made of the volatile salt of *sponge*, but no notice of its containing it in so great a quantity;

tity; both the spirit and volatile salt of *sponge* are there highly recommended in the stone and gravel and king's-evil, and its lixivial salt in a nephritic colic.

The analysis of coral and other marine plants,

1710.

Count Marfigli, who with indefatigable labor had long studied the nature of all marine productions, confesses he was long in suspense, whether to range the *corals* among the plants of this element; what determined him at last was the following experiment.

He put a branch of *coral*, fresh taken out of the sea, into a vessel with some of the sea-water, he observed the red soft tubercles began gradually to swell, and to expand themselves after, displaying at the same time white flowers, disposed in a radiated form, in manner of a star, with 8 little *petals*, supported by a *calix*, divided into the same number of parts. The instant the *coral* was taken out of the water, these flowers closed and formed themselves into a globular figure, which upon pressure yielded a milky liquor, supposed to contain the seed of the plant; for where they shed this juice, whether it be on rocks, or on any other solid substance, there young shoots of red *coral* afterwards appeared.

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He repeated often the same experiments, and always with the same appearances, but after 8 or 10 days, the above tubercles begin to grow flaccid, and then become yellowish, after this they wou'd no more expand themselves.

The Count after these experiments cou'd no longer hesitate to range *coral*, and all other marine productions of the same tribe, among the plants, which till then he looked upon to be stony concretions.

By their *analysis* they all yielded the same principles, viz. a *flegm*, a volatile urinous salt, which still retained the odor of the element the plant grew in, and a black fetid oil: what remained in the retort, yielded by lixiviation, &c. a little fixed salt: the other marine plants which the Count analysed, are the different kinds of the *madrepore's*, the *eschara marina*, the *corrallium album verrucosum*, and several species of the *lichen*. The Count sent specimens of all those marine plants, together with what they by their *analysis* yielded, to the academy, that they may compare them with the principles of other plants, and see wherein consisted the difference.

M. Geoffroy in order to verify those *analysis* the Count made, took a pound of the red coral of the shops, and analysed it; he first had 2 drams and 10 grains of a redish volatile

latile urinous spirit, which appeared to him not to differ from common spirits of harts-horn ; it was exactly like that sent by the *Count*, for both equally turned the syrup of violets green, and made a *coagulum* with a solution of corrosive sublimate.

A further account of these marine substances.

The natural history of *coral* and all other marine productions of the same tribe has been hitherto very little known : all the ancient naturalists looked upon them to be stony concretions ; but as arts and sciences began to revive and flourish in the last centuries, *Botany* in like manner began to be cultivated with more care. M. *Tournefort* who indisputably was one of the greatest *Botanists* of his, or any other age, and who had taken infinite pains to improve *Botany*, who had ranged all *Greece* and *Asia*, even to the borders of *Persia*, from whence he brought 1356 new plants, did not think the marine productions of our seas unworthy his attention, accordingly he tells us he made in 1700 several journies to the coasts of *Spain* and *Portugal*, purely to investigate the nature of those marine plants, as they were then universally looked upon to be ; yet notwithstanding all his researches, he confesses if they are plants, they differ widely from all the plants he had hitherto known ; for he
cou'd

cou'd discover neither root, seed nor any thing *analogous* to them, to enable him to account for their growth or increase: he found they wou'd indifferently adhere to any solid substance they met, some being found adhering to a piece of a bottle, others to a human scull, and contrary to all other plants to grow downwards: in their exterior structure they differ from all other plants, nothing like tubes, &c. being discoverable in them, but seem rather to resemble the *filex* in their structure; and here he owns he has strong suspicions, that both (the *coral* and *filex*) may be produced in the same manner, by *apposition*, or in the school-term by *juxtaposition*.

As to the *filex*, he is satisfied that in its first formation it was in a liquid state; for he has several petrifications of it, formed in several shells, which demonstrably evince its original liquid state. As therefore he cou'd not satisfactorily account for their manner of growth, &c. he gave them one generic name of *herbæ marinæ*; the great *Ray* gave them the name of *herbæ imperfectæ*; and *Linneus*, a very modern botanist, who published his *Species Plantarum universalis* in 1753, only gives them the name of *cryptogamia algæ*.

Thus matters stood, all Botanists acquiescing herein till 1710, *Count Marsigli* in his natural history of the sea, examining these
marine

marine productions, discovered something like flowers in *coral*: the novelty of the thing excited the curiosity of others to examine this matter with more accuracy; among those M. *Peyssonel*, a learned and eminent *Botanist* of *Marseilles*, applied himself more particularly to the study and discovery of the true nature of *coral*, and all other marine productions of the same tribe. In the course of his inquiries he discovered, that *coral*, and all the other hitherto reputed marine plants, were the work of a certain sea insect, not unlike the *urtica marina*, which like many land insects, fabric and make lodgements for themselves and their young.

Coral therefore and all of the same tribe may be properly considered as an assemblage of shells, each of which contains its little animal, as all other shells are known to contain theirs. M. *Peyssonel* further adds, that what *Count Marsigli* took for flowers of *coral*, were in reality the paws of the little insect, which he employs to catch other animals for its food, to defend itself from others, and probably for more uses than we know. M. *Peyssonel* addressed these observations to the Royal Academy in 1727, assuring them he had often verified the same in his voyages to the coast of *Africa*, where the greatest *coral* fishery known is.

M. *Reau-*

M. Reaumur had no sooner read M. Peyssonel's memoir than he stood up for the vegetable nature of *coral*, and all of the same tribe. He tells us that by order of the Court, the Intendant of *Marseilles* sent some *coral* fresh taken out of the sea in some of its own element, sea-water; and in order to have its rind on, sent it on men's shoulders to *Paris*, where when examined, it visibly appeared to be composed of two distinct substances, the exterior or cortical part was both softer and paler than the inner part. This cortical part M. de Reaumur thinks might be left in the peaceable possession of its *vegetable nature*, whatever becomes of the inner part, nor does he see more absurdity in a stony substance's having a vegetable covering, than in an animal substance's having a stony covering, as in all shell fish, the more so, as Count *Marsigli* discovered flowers in the above vegetable covering of *coral*, tho' this new system says he, *wou'd needs metamorphose those flowers into insects*.

M. Peyssonel's account of *coral* and all other marine productions appeared so extraordinary to M. Reaumur, that tho' he analysed it in 1727, yet in respect to the author, he concealed his name, but adds, "how extraordinary soever this system may be, it must be confessed, that it does not appear to be the produce of a luxuriant imagination,

but rather seems to be the result of reiterated observation.

“ This author, continues M. de *Reaumur*, takes notice that formerly the *tubularia* was ranged among plants, whereas it is now confessed to be composed of a multitude of tubes, which as to their color, resemble *coral*; yet it is known to be the work as well as the habitation of a sea insect. 2°. The *astroites* allowed to be of the same tribe with the *madrepores*, is in like manner an assemblage of parallel tubes, like the *tubularia*, with only this difference, that in the *astroites*, those tubes are divided into segments, which at their openings have a radiated appearance, whence its name. 3°. there are others of this tubulated kind, which exteriorly have the appearance of that sea insect called *scolopendra marina*, and are thence called *scolopendrites*. 4°. The *balanus* likewise is one of those shell fish, formerly taken for the *concha antiferia*. 5°. The *madrepores* resemble exteriorly the *coral*; yet like the *astroites*, they have their pores, its true, not so near each other, tho’ they are divided into segments like them. If therefore, continues the author (*Peyssonel*), the *tubularia*, *astroites*, and *balanus* are the work of a sea insect, there is a very strong presumption that *coral*, the *madrepores*, and all of the same tribe are no less the work of some sea insect. 6°. Those
pre-

pretended flowers of *coral* are likewise observable in the *madrepores*, and in all other marine productions of the same tribe ; but in reality they are no more than the horns and paws of those insects, which expand themselves in those little cells which they inhabit, and which were heretofore taken for *papillæ*, observed gradually to swell and expand themselves.

M. *Peyssonel* affirms, he has seen some of those horns rise, some fall, others to expand, and others to close themselves, if the water they were in was any way disturbed, all which flowers were never before known to do.

7°. It is a known fact that *coral*, the *madrepores*, &c. will at any hour or season of the year put on the above appearance of flowers, whereas it is known that all other plants have their proper season to flower in. 8°. As to the milky liquor observed to fall from those pretended flowers of *coral*, and which has been supposed to contain the seed, or what is *analogous* to seed, what produces *coral*, this milky liquor appears to have a greater *analogy* with the *milt* or spawn of fish.

Lastly, when the cortical part of *coral* is suffered to putrefy, it exhales the odor of putrid fish, and what is still more, by its *analysis* yields the same principles that all animal substances do. This observation alone

shou'd induce us to consider all those marine productions the work of some animal."

Notwithstanding the force and justness of all these observations and reasonings, notwithstanding there appeared all the reason in the world to believe *coral*, and all of the same tribe, the work of some insect, yet Count *Marfigli*'s opinion prevailed universally, (so hard is it to shake off prejudices once imbibed), and wou'd probably still continue to do so, had not *M. de Jussieu* the younger the fortune to discover those very insects in question. He confesses this diversity of opinions, concerning those marine productions, not only raised his curiosity, but urged him likewise to the discovery of the truth of this matter; he accordingly tells us, that in September 1741 he went to the western coast of *Normandy*, to investigate the nature of those marine productions, and having provided himself with the necessary glass vessels to make his experiments in, the first of those marine productions he tried this way was the *fucus manum referens* *Inst. R. H. Tournef.* in some time after he had put this with some of the sea water into the glass vessel, he began to perceive several small cylindrical bodies, beginning to expand themselves. 'Thro' each expansion appeared a white, transparent, cylindrical, hollow body, which when it arose to the height of $3\frac{1}{2}$ lines, resembled

resembled a tower *, terminated by 8 small spires, which upon the least thing touching them, or even disturbing the water they were in, wou'd presently contract themselves, and wou'd after appear like so many round turrets.

M. de Jussieu made the same experiment with the *adanthum aureum marinum*, which is a compages of cylindrical tubes, joined together like so many reeds, affixed sometimes to an oyfter shell, at other times to a rock. All those tubes are closed at the top with opake bodies, of a deep red color. The remainder of their bodies were filled with a redish liquor. When this was put into the glass vessel with some of the sea-water, the same opake body, which closed the above tube, was seen to raise itself, like a spherical red head, which insensibly expanded itself. In this expansive state, several long, slender white horns were manifestly visible, like those of the *polypus*, (an aquatic insect lately discovered by M. Tremble), which wou'd retire and hide themselves within their respective cells, the instant they were taken out of the water, or even before, if the water they were in was any way disturbed, or they themselves were in the least touched or molested, and when the water these insects were in was suffered to putrefy, and which would happen in three or four days,

* See Pl. viii. fig. 1, 2, 3.

these

these *polypus's* wou'd then quit their cells, and fall to the bottom of the vessel, expanded and to all appearance dead, which plainly evinces they were not immovably affix'd to their cells; these *polypus's* appeared of different sizes, the trunk of some appeared 3 lines long by 2 broad, and viewed thro' a microscope, they appeared like whitish worms; by their lower parts, they appeared lightly affixed to the bottom of their cells, the middle of their bodies was a little dilated, and their upper parts, supposed to be their head, were armed with 10 white, slender horns, which formed themselves into the shape of a tundish. Whoever wou'd see these insects intire, all that is necessary is to lay open any of their cells; by this means the whole animal will appear in its natural form.

The 3d marine production M. de Jussieu examined was the *porus cervinus* of Imperatus, the *alga marina*, *platyceros porosa* of Baubin, which was hitherto taken for a plant.

The 4th was the *madrepora arenosa anglica* of Ray, both which like the former, were found to contain the same kind of insects, which from the number of horns they appear'd to have, may properly be called *polypus's*.

Tho' M. de Jussieu from the above experiments was satisfied as to himself, that those marine productions, which hitherto
passed

passed for plants, were the work as well as the habitation of an insect or animal, yet he judged it proper to verify the same, before he would venture to publish any account of them; accordingly he returned in April 1742, and spent the most part of the September following on the Coasts of *Normandy*, where to his intire satisfaction he verified the above experiments.

Not only the present age, but even the latest posterity must retain a grateful sense of the pains and trouble M. de *Jussieu* has taken to set this point of natural history in its fullest light, whereby he has put it beyond all manner of doubt, that what were hitherto taken for marine plants, are no more than the work of so many *sea insects*, a lodgement for themselves and their young.

Chancelagua an American Plant. 1707.

This plant is a species of the wild centory, it grows in *New Spain*, but in greater plenty about *Panama*. In all such disorders as require a copious discharge by the emunctories of the skin, it is reputed to be of singular service, of course in pleurisies, catarrhs, rheumatisms, and in all fevers of the lymphatic kind, when there is no inflammation or great heat. It has likewise been observed to be of service in agues and in the humoral

humoral gout, but would be improper in an inflammatory or tophaceous gout.

The manner of using it is in infusion. A dram, and sometimes 2 drams of the tops cut small and infused in a good water glass of boiling water is sufficient for a dose. The vessel shou'd be covered for half a quarter of an hour. It is given to the patient as warm as he can take it, covering him after in order to raise a sweat. Any cordial julep for the same intention may be added, to render it more palatable to the patient.

The *Indians* have had long experience of the virtues of this plant, which they carefully concealed from their severe *task-masters*. The cruel treatment those poor creatures daily meet with will never entitle the *Spaniards* to their affection.

M. *Pas* Doctor of the university of *Montpelier* received the above account of this plant from his correspondent in the west *Indies*. He adds that he does not doubt but it will one day become of as general use as the *cortex*.

Of Japan earth. 1709.

The natural history of *Catechu*, or what goes under the name of *japan earth* is but imperfectly known. Some travellers pretend it is a kind of earth found in *Japan*, but were it an earth, it would not intirely dissolve
in

in either spirits of wine or water, as it is known to do; others, and with more probability say, it is an inspissated juice, obtained from a plant of the same name; others will have it to be a concreted juice, had from several astringent plants; lastly, others pretend it is obtained from the fruit of a tree of the same name, that grows in the island *Sumatra*, and is carried from thence to *Japan*.

M. *Boulduc* dissolved 4 ounces of *Japan-earth* in a sufficient quantity of water, and after it had been filterated and evaporated, as in the usual way of making extracts, he had 2 ounces, 3 drams of an extract, which differed in smoothness only on the palate; from what is imported; for all it lost was the earthy useless parts; the *residuum* weighed 1 ounce, which yielded to spirits of wine 5 drams of an extract: he dissolved the like quantity in spirits of wine, he had 2 ounces 6 drams of a beautiful extract, more sapo-naceous than the former, but more harsh and disagreeable on the palate; from the 9 remaining *drams* with water he got 5 drams of a harsh, disagreeable extract.

From these *analyses*, M. *Boulduc* thinks that *Japan-earth* requires no preparation, and if any shou'd be thought necessary, water alone will purify it from its earthy parts: the bigness of a pey held in the mouth go-

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ing to bed has been serviceable in relieving a fore-throat.

Of the good effects of Pareira Brava. 1710.

This is the root of the wild vine, which grows in *Brazil*. *Piso*, whose natural history of that country was published in 1648, makes no mention of it. There are two kinds of it, the brown and the white; both have a bitter taste with some sweetness, like that of liquorice, but without smell. It is much celebrated among the *Portuguese* as an alexipharmic. *M. Geoffroy* has often tried it in nephritic colics, wherein he says, it scarce ever failed him: he also thinks it serviceable in ulcers, both of the kidneys and bladder as a cleanser. He gave it to one, who had an ulcer in his kidneys with great success; he adds, towards the end of the cure some drops of the balsam of *capiro*, and he conjectures from *analogy*, that it wou'd be as good, as an incider in a humoral asthma, which is known to proceed from a thick *flegm*, stuffing the *bronchia* and pulmonary vessels, and on that account it must likewise be good in a jaundice, which proceeds from a thick *bile*; his success in both these cases confirmed his conjecture: he gave it to an old man of 72, who was both weak and almost suffocated with *flegm*, which was so viscid, that he cou'd not haue it up; after

after he had taken 2 cups of an infusion of this root at half an hour's distance from each other, he threw up so great a quantity of *flegm*, that one might say he had rather vomited than spit it up; he was however relieved for that time from his asthmatic fit. He gave it to a woman afflicted with a bilious colic, accompanied with an universal jaundice, in so much that her urine wou'd tinge a linen rag dipped into it: her stools were little in quantity, and whitish; after she had been let blood, he gave her 3 cups of the same infusion, at half an hour's distance from each other: soon after taking the 3d cup, she found ease from her colic, her bowels were opened soon after, her stools became highly bilious, she made water in great plenty, which by degrees returned to its natural color; she continued taking the same infusion every 4 hours, by which means she got shut of both colic and jaundice in the space of 24 hours. Whenever she had any returns of either, she had recourse to the same infusion, which always relieved her. The way of using it is thus; 2 drams of this root sliced are boiled in 3 pints of water, reduc'd to one, which is divided into 3 parts, and sweetened like tea, either with sugar, or what is better, syrup of marsh mallows. As a preventive against the gravel, it is given from 12 to 18

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grains,

grains in powder, or 24 grains are boiled in a cup of water, which is taken the first 8 days of every month, sweeten'd like tea.

A new Febrifuge. 1711.

The many trials M. *Reneaume* has made with the *Cypress nut*, or in its place, with our common *galls*, made him look upon it as a very safe and effectual febrifuge, exempt from some of the inconveniencies of the *cortex*, and in some things it has the advantage of the *cortex*; in the first place, it is not so bitter, nor does it heat so much as the *cortex*, it is given in a less dose, nor does it require to be repeated so often, lastly it costs much less than the *cortex*, a circumstance well worthy notice, especially in regard of the poor.

As there are some cases where the *cortex* is known to fail, it might be of singular service to know when to substitute this new febrifuge. M. *Reneaume* thinks this new febrifuge may be well substituted in the place of the *bark*, when the ague proceeds from weak, relaxed fibres of the stomach, and bad digestion, always the consequence of such relaxed fibres; in such a case, the galls, as being a more powerful astringent, will more effectually remove agues proceeding from such a cause; but when agues are complicated with obstructions in the liver, when

when the *bile* is not secreted or mixed in a sufficient quantity with the chyle, whence crudities in the *primæ viæ*, the *cortex* has then the preference ; its bitterness will amply supply the defect of the *bile*, and it will have the same effect on the chyle, to assimilate its component parts, as the *bile* is supposed to do.

Among others, who upon M. *Reneaume*'s recommendation had tried this new *febrifuge*, M. *Homberg* affirm'd he had often made use of it to very good purpose ; however, M. *Bouldac* assured, that he gave it 6 times in both tertian and quartan agues to no purpose ; Messrs. *Lemery* father and son, and M. *Geoffroy* the elder, said it often brought on a flux, and that the ague thereupon returned, which cou'd not be removed after but by the *cortex* ; they all however are of opinion that it shou'd not be laid aside ; for time and a greater number of experiments may at last find out the particular cases, where it might prove useful.

Of the medical use of the cortex. 1713.

M. *Reneaume* examines here the several cases, wherein the *cortex* shou'd be given : he considers the *cortex* as a bitter, as an astringent, and as an absorbent or stiptic, all sensible qualities of the *cortex*, without the help of its *analysis* by fire ; as a bitter,
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it corrects the four, acid juices in the stomach and intestines, as well as in the blood; for the bitter and acid are known to compose the sweet; as an absorbent it covers and sheaths those four juices in the stomach, and by that means prevents their carrying their action any further, the coagulating our juices, which otherwise they wou'd do, whenever they abound in the blood; lastly, the *cortex* as an astringent, braces up the relaxed fibres of the stomach, strengthens the coats of the vessels. The *cortex* therefore as a bitter, warms the blood, accelerates the circulation, thereby promotes the several secretions, especially of the skin; the medical use therefore of the *cortex* shou'd be founded on these its known properties; when therefore the food, thro' the weakness of the stomach, is ill-digested, turns sour, and runs into crudities, and the *bile* is either weak, or not secreted in a sufficient quantity to correct those acidities, the *cortex* as a bitter, will supply the place of the *bile*, to assimilate the component parts of the *chyle*, and as an absorbent it will sheath and obtund those four juices, that too often abound in weak stomachs, and lastly as an astringent, it will brace up those weak, relaxed fibres, of course remove all such fevers as proceed from crudities, lodged in the *primæ viæ*; the salutary effects of the
cortex

cortex are not confined to the *primæ viæ*, but are carried further into the blood; as a bitter, it dissolves all fizy juices circulating with it; as an astringent, it braces up the coats of the vessels, restores their natural tone and springiness. From such good effects, the several secretions made from the blood are restored to their natural state, the obstructions, the natural consequence of a defect in the secretions, will be removed, and all such fevers as proceed from obstructions will likewise be removed: the slow hectic fevers, which generally proceed from some inward ulcer, wou'd, M. *Reneaume* thinks, rather be increased by the use of the *cortex*; for by bracing up the fibres of the stomach, it wou'd increase the appetite, and by that means too great a supply of *chyle* wou'd be daily carried into the blood, which wou'd necessarily add more fuel to the ulcer, and thereby increase the fever.

M. *Reneaume*, after the example of *Sydenham*, gave the *cortex* in both hysteric and hypochondriac cases, especially where the *paroxysms* were regular, and with the same good success; he also gave it after dysenteries, to strengthen the tone of the bowels: such disorders of the stomach, where there is no fever, are well known to be relieved by the *cortex*.

The

The history of the Cortex-tree, how it came first to be discovered, and who first introduced it into Europe. 1738.

The *cortex* tree grows in great plenty on the mountain *cajanuma*, about $2\frac{1}{2}$ leagues south of *Loxa*. It was from thence the first bark brought to *Europe* came, and till within those 15 years, the merchant was obliged to have certificates, that the *cortex* he imported grew on *Mount-Cajanuma*. M. de *la Condamine* went to the place where this tree grows; he found it had both flowers and fruit the 3d of February 1737, and that it had the same in all seasons of the year.

They commonly distinguish 3 kinds of this *cortex-tree*; the *red*, the *yellow*, and the *white*. Some pretend they only differ in their virtues, the white being good for nothing, the red exceeding the yellow in its virtue, but M. de *la Condamine* was assured by one of the natives, who fixed his habitation on *Mount-Cajanuma*, that there is no visible difference between the red and the yellow, in either their flowers, leaves, fruit, or bark exteriorly, but upon stripping the bark, the yellow is observed to be softer, and not so high colored; both grow together, their bark is indifferently stripped, and as it dries, this difference becomes less perceivable; both

both are brown exteriorly, this color being the *criterion* to know the best *cortex* by.

As to the white, its leaves are more roundish, and rougher than those of the red and yellow, and its flowers, fruit and bark are, by much the whiter.

The *cortex-tree* grows singly in the best sheltered parts of the mountain, but has never been found to grow on the plains, nor is it found even in the mountains to grow in clumps, but rather dispersedly here and there among other trees. When it is suffered to come to its full growth, it is found to be as thick as a man's body; but in the general it is not above 8 or 9 inches in diameter; when it is intirely stripped of its bark, it most commonly dies, all those trees that were first stripped, are long since dead; formerly the thickest bark was most esteemed, now it is the smallest that is chosen, owing, as the director of an English factory at *Panama* informed M. de la Condamine, to the *analysis* of both, and the experience of the superior virtues of the one above the other; probably it is as much owing to the difficulty of curing the thick bark thoroughly, that it is so much fallen into disrepute; for they strip this bark in all seasons of the year; it must be thoroughly well dried in the sun for many days, and shou'd never be made up into bales, till all the humidity is

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exhaled ; when this is not carefully attended to, the bark becomes mouldy, and worm-eaten ; the leaves of the *cortex-tree* are supported by a stem, about half an inch long ; their upper surface is of a beautiful deep green, the under surface is of a paler green, and terminate in a point, like the spear of a lance ; the summit of every branch terminates in a bunch of flowers, which before they are blown, are not unlike lavender flowers ; when the flowers fall, the *calix* begins to swell in shape like an olive : as it increases, it becomes a fruit, lodged in two pods, which as the fruit ripens, is burst from below upwards, whence a flat, redish seed falls. It is very difficult to find this seed on the tree, for if one does not watch the instant it is ripe, the least agitation of the air disperses it, as it is so very small, some not being half a line in diameter. See Plate IX.

The medicinal use of the bark was long known to the natives, before the Spaniards discovered it, owing to their natural antipathy to these their severe *task-makers* ; the manner they gave it was in infusion. But even after the Spaniards of *Loxa* had come to the knowledge of its virtues, the rest of the world were strangers to those great virtues : how it came to be known out of *Loxa*, was thus :

In

In 1638, the Countess of *Chinchon*, the Vice-roy of *Peru's* lady, had been long afflicted with an ague, which baffled all the remedies she had hitherto taken; this coming to the knowledge of the *Corregidor* of *Loxa*, a creature of the *Vice-roy's*, he sent some of this bark, assuring his Excellency, that he would answer for the effect: the *Corregidor* was called up to *Lima*, to regulate the dose and prepare it, and after some trials made on others in this fever, which was attended with success, the *Vice-roy's* lady took it and was cured. She in compassion to others afflicted with the ague, had a good quantity of it prepared, and dispersed it herself, whence it was called the *Countess's powder*; but in some time after she consigned that province to the Jesuits, who distributed it *gratis*; it was then called the *Jesuit's-powder*. The Jesuits of *Lima* took the opportunity of their *Procurator-General* of *Peru's* coming to *Europe*, and to *Rome*, to send a quantity of this bark to Cardinal *de Lugo*, who was of their order; by his distributing it at his own palace, it was now called the *Cardinal's powder*, and given *gratis* to the poor, but at the weight of silver to others: it is further reported, that the above *Procurator-General*, as he was travelling thro' *France* in his way to *Rome*, cured *Louis* the XIVth, then *Dauphin* of *France*,

of an ague.

When the *Vice-roy* and his lady return'd to *Europe* in 1640, their physician *Juan de Vega* brought a large quantity of this bark with him to *Spain*. He sold it at 100 *rials* the pound in *Seville*; * the great reputation and demand for this valuable drug continued, while any of the old trees of *Mount-Cajanuma* cou'd supply it: but when it became scarce, and little was to be had, some of the inhabitants of *Loxa*, considering their own profit only, mixed the bark of other trees with the *cortex*; the cheat was soon discovered, in so much, that it now wou'd not bring half a *piastre* the pound, which sold before at *Panama*, for 4 and 6 and for 12 *piastres* the pound at *Seville*.

In 1690, some thousand bales of it remained at *Piura* and along the coast of *Payta*, which began the ruin of the trade of *Loxa*; no body now wou'd take it on board his ship. Among other kinds of bark which they used to mix with the *cortex*, was the bark of the *nettle-tree*; but *cascarilla* was the bark they mostly mixed with it, of which there is great plenty in the same country.

To prevent those frauds and abuses, every bale has been of late examined at *Payta*, before it is sent to *Panama*; but it must be confessed, notwithstanding all this care, the

* A *Rial* is computed to be equal to *six-pence* English.

buyer

buyer must still depend on the honesty of the feller, as he is no judge of the matter himself.

They discover every day on the mountains of *Cajanuma* some new *cortex-trees*, and on the same chain of mountains 30 leagues south east of *Loxa*, which are of late years come into repute : those who deal in this drug, are careful to conceal when they discover any new place, where this tree grows ; they have discovered some very good *cortex-trees* at *Rio-Bamba*, 40 leagues to the north of *Loxa*, and at *Cuença*, still more to the north east ; and on the mountains of *Jaen*, 60 leagues to the south east of *Loxa*.

Quina is the name the old natives give it, how it came to be called *quina-quina*, is not easy to discover, unless we shou'd think they meant the *bark* of *barks*, the *bark* by excellence : this conjecture seems to be countenanced by their doubling several other names of plants, as *vira vira*, *pinco pinco*, *saya saya*, *moco moco*.

It has happened to the *cortex*, what has happened to several other things, to be of little value in the country they grow in : this *cortex* is in no great esteem in *Peru*, they are afraid to use it at *Lima*, more so at *Quitto*, and at *Loxa*, they scarce ever use it.

M. de la Condamine gave some he brought from *France* to a Spanish Creol, at *Puerto Viejo*,

Viejo, about 60 leagues distant from *Loxa*, and in the neighbourhood of *Guayaquil*, where they carry on a considerable trade in this same bark; yet the inhabitants never heard even the name of this valuable drug, so renowned all over the rest of the world.

M. *de la Condamine* had sent to him by the Controller of the customs of *Payta*, 5 different kinds of this *cortex*; one from *Loxa*, and the others from different places, particularly from two places, where it was lately discovered. M. *de Jussieu* the younger made several trials with each of them, which were attended with all the desired effect, but what is pretty extraordinary, whenever he prescribed it, he was obliged to conceal its name, so little credit has this valuable drug in its own country.

Of Cascarilla. 1719.

This is the bark of a tree brought from *Peru*, it so far resembles the *cortex* brought from the same place, that some call it *kin-kina spuria, urens, odorifera*; it is the *cortex elaterij* of the shops, so called from its bit-

Explanation of the Figure.

- A, A branch of the *cortex-tree*.
- B B B, The flower in various aspects.
- b, A flower torn to see the *pistillum*.
- c c c, Some buds not yet unfolded.
- D D D, The fruit of the *cortex-tree* in various seasons, some ripe, others with the seed fallen.
- E, The leaves.

ing

ing quality, like *elaterium*. *Cascarilla* is covered with a whitish *pellicle*, which is thin, insipid and wrinkled in many places: the bark itself is of a pale brown color, and less compact, and more friable than the *cortex*, but more bitter, leaving an acrimonious, and some what aromatic taste behind it: tho' the *cascarilla* resembles the *cortex*, as to its exterior appearance, yet it differs greatly from the *cortex*, as being more bitter and acrid, and becoming almost a caustic upon the tongue, whereas the *cortex* is of a more disagreeable bitter and more styptic.

The *cascarilla* either warmed or burnt, casts forth an aromatic smell, which the *cortex* does not, a manifest proof that it abounds with more resinous parts than the *cortex*.

M. *Boulduc* analysed this bark. He infused an ounce of it in spirits of wine, which yielded him five drams of a biting, aromatic and bitter extract, of a fine purple color. M. *Boulduc* never obtained so much extract from any vegetable substance in the same given quantity, an ounce of the *cortex* scarce yields 20 grains of an extract.

M. *Fagon* late Physician to the King, often told M. B. that before the *cortex* became so common in *Paris* as it did after, that he gave the *cascarilla* in all *agues*, with very good success; for as it abounds with more resinous parts than the *cortex*, it on that account

count attenuates the fizy lymph and viscid humors, which are always the source of *agues*. It has besides this advantage of the *cortex*, a less quantity will do ; nor does it require to be repeated so often as the *cortex* does.

It is more than probable that the virtue of all febrifuges consists in their resinous parts. This was M. *Fagon*'s opinion, and for that reason, he generally ordered a tincture of the *cortex* made on brandy, along with its decoction, to restore to it those resinous parts the water cou'd not dissolve, and thereby render it so much the more effectual ; and we find other Physicians with the same intention join with it some aromatic, as *radix serpentariae virgin*, &c.

Apinus an eminent physician at *Altorf* seems to be the first, who employed an infusion of *cascarilla* in epidemical and catarrhal fevers, and in substance in common fevers. The great *Stahl* extended its use further ; he gave it in *pleurisies*, *peripneumonies*, and in the *chin-cough*, from a knowledge of its attenuating and inciding quality, and in that sense, it accelerates the circulation, increases perspiration, where that is wanting.

M. *B.* experienced its good effects in flatulent colics, in hysteric and hypochondriac affections. When the indication is only to attenuate fizy juices, the tincture will then
be

be the fittest, as it contains the resinous parts; but when the intention is to brace up the relaxed fibres, the *cascarilla* should be then employed in substance, in powder, as containing its earthy parts, in which consist its stiptic and astringent virtues; in this case, it has been found serviceable in the inward *hemorrhoids*, especially in *flegmatic* habits. For it not only attenuates the fizy lymph, and increases perspiration, by which means all the secretions become more regular, but as an astringent, it braces up the relaxed coats of the *hemorrhoidal* vessels, the tone of the vessels thus restored, the *hemorrhoidal* flux is promoted, this effect M. B. had more than once experienced. But what gained *cascarilla* the highest repute of all was the great success it had in the *dysenteries* of the year 1719, and that whether they were attended with a fever or otherwise. *Ipecacuana* lost then almost all its credit, whilst *cascarilla* remained in great vogue. M. B. further adds, that he observed that *ipecacuana*, and most other vegetable emetics leave a great sinking of spirits, and a great weakness of the stomach after them, but that *cascarilla* was found to restore it soon to its former state and vigor. Thus *cascarilla* rivalled two of its country drugs the *cortex* and *ipecacuana*, nor is it improbable, but it might have some

other advantages over both one and the other.

Of our European opium. 1712.

Opium is one of the most useful medicines we know ; it however has been observed to be attended with some ill consequences, it has thrown some into *lethargies*, others into *deliriums*, convulsions, *synopes*.

M. *Boulduc* examined most of our European somniferous plants, to see if he cou'd find some among them, that might have the salutary effects of the *Asiatic*, and be exempt from those complained of ; in his researches he discovered that the head and seed of the *papaver erraticum*, and not the flowers, as most *botanists* have hitherto believed, are what contain the somniferous virtues of this plant. By the many trials he made, he found that an extract from the above heads answered every end of *opium*, but more particularly in all rebellious coughs. 4 ounces of the above heads yielded 5 drams of a solid extract, which may be given from 2 to 3 or 4 grains for a dose.

The ill and sudden effects of the cicuta aquatica.
1715.

M. *Faugeon* informed the academy, that 3 German soldiers died suddenly after eating of this root, which they mistook for the *calamus aromaticus*. The stomach of one of them

them was pierced quite thro'. The stomachs of the other two were corroded only, and full of a frothy liquor, the intestines were very little altered; but the lungs and the heart were both flaccid and withered, and their vessels full of a liquid blood. *Wepser* has no instance of such an effect of this root, as to kill those suddenly, who had eaten of it.

Of the palachine leaves. 1716.

These leaves grow on a tree in the *Louisiana*. They are called *palachine* from the *Palaches*, a people of that country. These leaves taken like tea are found to purify the blood, evacuate the *bile* and *flegm*, relieve great lassitude, and be serviceable in the gout and gravel.

M. Faugeon had this account from a captain of a ship, who came from *Louisiana*, and who experienced their good effects on himself. He further added, that the inhabitants of the country, who before appeared of a pale, wan complexion, soon recovered upon taking this tea, and acquired both a good complexion and color.

Of the root gin-seng. 1718.

This root is highly esteemed in *China*. The *jesuit missionaries* were the first that brought us acquainted with it. It is a bifur-

cated root, not unlike the thighs of a man, whence its name, M. *Bourdelin* in 1697 read before the academy the account he received of this root. The easterns always accustom'd to give marvelous *epithets* to things, stile it *the pure spirit of the earth*; a *sure receipt for immortality*, and many such high *encomiums*. It first came to us from *Plateu*, but now we have it from *Leauton*, a province in eastern *Tartary*. It grows no where but in a shade, and under a tree very like our *sycamore*. In this memoir of M. *Bourdelin's* it was recommended as a great purifier of the blood, and strengthener of the stomach, to raise the languid Spirits, revive the *callidum innatum*.

In the *lettres edifiantes et curieuses* published in 1713, there is a letter of *Pere Fartoux* concerning this root. He there says, that he was sent in 1709 by the emperor of *China* to lay down a map of that part of his new conquest of eastern *Tartary*, where he saw 10000 Tartars gathering this root, the emperor having imposed a tax of two ounces of this root on every *Tartar*. He bought what more they did gather at the weight of silver, which he sold after at 4 *per cent*, profit in his own dominions. This sufficiently proves the high value they set on this root.

This father conjectures as *Tartary* and *Canada* are nearly in the same climate, this
root

root might very probably grow in the forest of *Canada*. As these letters fell into the hands of *Pere Lafitau*, missionary of the same order at *Salut St. Louis* among the *Iroquois*, a man naturally curious in *botany*, he went herboring in the forest of *Canada*, and after much pains and fatigue he found this root in so high esteem with the *Chinese*. The *Iroquois*, curious enough about plants, tho' no *botanists*, and who long before discovered the virtues of it, call it *garent-oguen*, q. d. *two things separated like two thighs of a man*. Some of the *botanists* of the academy seemed to doubt which of the two, the eastern or western *gin-seng* was the true one. Happily *P. Lafitau* came this year to *Paris*, and cleared up all their doubts, and by the account he gave of it, it is the same that *Pere Jartoux* saw gathered in *Tartary* in 1709. He also confirmed the virtues ascribed to it in both *M. Bourdelin's* memoir, and the account *Pere Jartoux* sent of the same.

It now was known that the academy was before acquainted with both this root and its virtues, tho' both had been forgot, for *M. Sarasin King's* physician at *Quebec*, an able *botanist* and correspondent of the academy's, sent a *specimen* of this root to *M. Fagon*, then professor of *botany* in the *King's* garden in *Paris* so early as 1704, he called it *aralia humilis fructu majore*. The English discovered the
same

same root in *Maryland*. Ray calls it *plantula marilandica, foliis in summo cauliculo ternis, quorum unum quodque quinquefariam dividitur circa margines serratis*.

This is another American plant of excellent virtues we are obliged to the industry of those *jesuit missionaries* for, but there is this unhappy circumstance attending this plant, that it will not grow or thrive but in forests, and whenever it is deprived of its shade, it dies. M. de *Jussieu* attempted to raise it in the *King's Garden in Paris*, but cou'd not. M. *Reneaume* however thinks we may in some sense console ourselves, since the *hepatica nobilis Tragi*, an usual plant, tho' in much less esteem than it ought to be, is possessed of the same virtues.

As this root *gin-seng* is found in both forests of *Tartary* and *Canada*, it may help to corroborate the conjecture of those, who pretend that *America* was peopled by a colony from the north of *Asia*. Some future discoveries of this kind may in time satisfactorily clear up this important point of natural history.

Of the apinel root. 1724.

This root was so called from M. *Apinel*, a captain of horse, who first discovered it. It is likewise called the root against serpents, it killing all such serpents

pents as eat of it, or even by putting it into their mouth, tied to the end of a stick. When one has eat of it, or rubbed his hands and feet with it, the serpents will run from him, he may with all impunity catch and handle them. M. *Hauterive* procuror general at *Martinico* has seen these effects from this root. It is likewise a great restorative, and powerful provocative.

A new kind of rocket. *ibid.*

M. *Isnard* discovered this new kind of rocket, he characterises it *eruca supina alba*. We had before the *tenuifolia perennis flore albo*, and the *latifolia sativa alba*. M. *Isnard* adds that he had experienced the good effects of the *syrupus de erysimo Lobelii* in relieving the hoarseness of preachers, lawyers, chanters, &c. the manner he employs it is thus. He directs the patient to drop 4 drops of this syrup on his tongue, swallowing them as they drop, and repeating them every 4 hours till he finds benefit, or is cured. He further adds that he had often cured an extinction of voice with the same syrup.

And here occasinally M. *Boulduc* said, he had often given an infusion of the *erysimum vulgare* with success, in both a hoarseness and in an extinction of voice. The green to a dram and a half, the dried herb to a dram, infused in two cups of boiling water, and sweetened after

after like tea. *Lobelius* says, *phonaſeos memini, tum juniores, tum ætate provectæ, quibus ferme jam amiſſa Voce et ſpiritu, limpida et ſonora vox pauculis diebus reſtituta*. In another place he ſays, *ſyrupus de eryſimo efficaciffimus, cujus beneficio, juvenculas decennio raudedine laborantes percuravi*. ib. p. 103. *

Of ſimarouba. 1729.

It is ſooner or later the fate of all thoſe medicines, cried up for *ſpecifics*, to fall into diſrepute, which is often more owing to the inattention of the preſcriber, than to any fault in the medicine itſelf; for all pretenders to phiſic think it is ſufficient to find ſome circumſtances or likenefs in a diſorder, wherein ſuch a medicine was attended with ſucceſs to preſcribe it, never conſidering that

* Theſe are not the only inſtances of the extraordinary virtues of our *indigenous* plants, tho' their uſe is now univerſally, though ſhamefully neglected, to give way to thoſe *exotics*, ſo dearly purchaſed, and which upon a fair trial are not found to be any way ſuperior to our own plants. Thro' the ſame ſupinenefs we trample under foot and overlook many other plants we call *uſeleſs*, becauſe we will not be at the pains to make the proper trials with them, or investigate their properties, whereby we may find plenty of plants common in our fields, fully as good for dying, all our ſtuffs, &c. as thoſe brought from the *Indies*. The *Cbryſanthemum ſegetum*, which is plenty enough in our cornfields, will ſtrike as beautiful a yellow as thoſe brought from *Louiſiana*, which by adding ſome other plant to it, might yield ſeveral ſhades of the ſame color. M. de *Juffieu* diſcovered ſeveral other, hitherto reputed *uſeleſs* plants, that are very capable of dying ſtuffs. How he came firſt to diſcover this, was by the different color the plants gave the paper in his herbal.

diſorders

disorders might, notwithstanding some exterior resemblance in some of their symptoms, be very different in their natures, so that what wou'd relieve one time, might be exceeding dangerous at another time. This is no where so apposite as in the case of *ipe-
cacuana*, which with *Piso* never failed in *Brä-
sil*, nor with *Helvetius* in *France*, in the worst of dysenteries ; but what lost it its reputati-
on was the giving it indiscriminately in all kinds of fluxes, whereas had it been pru-
dently administered, as the above authors and subsequent observation had directed, where there were crudities only in the *prima
vie*, or obstructions in the glands of the bow-
els, it would be found scarce ever to disap-
point the prescriber, or fail of success ; but injudiciously to prescribe it, where there was a *fluxus hepaticus*, or in dysenteries, in con-
sequence of drastic purgers, or phlogistic or inflammatory tensions of the *abdomen*, how cou'd it otherwise happen but to miscarry ? but here *simarouba* opportunely comes to its assistance.

In the dysenteries that raged violently in *Paris* in 1718, the celebrated *ipe-
cacuana* lost all its credit, it was observed rather to ag-
gravate than relieve those who took it : here *simarouba* was of divine assistance, scarce ever failing of success ; but there was as much circumspection here wanting, as in

the administering *ippecacuana* ; neither shou'd be given indiscriminately, and to every body ; for as it is a powerful astringent, was it given before due evacuation, it wou'd infallibly lock up the enemy, to the no small detriment of the patient.

Dia'corides makes mention of a yellowish bark, both thick and astringent, brought from the east, and which they called *macer* ; he says it was given in his time for *hemorrhages* of the nose and mouth, for dysenteries and *diarrhæas*.

Pliny likewise makes mention of a bark called *macer* or *macir*, which was also brought from the *Indies*, of a redish color.

Galen in his account of it agrees with both, and adds, *it is aromatic*.

It is probable that *Averroes* and the other Arabian phisicians were acquainted with this same bark, and what travellers relate concerning this bark, agrees with those accounts of the ancients, *that it was a yellowish astringent bark, and good for the dysentery*. It shou'd not therefore seem strange to find the *macer* tree in *America* under another name. We know that *Asia* and *America* have several plants in common, which are not known in *Europe*, and this may one day determine, that *America* was peopled by a colony from *Asia*. See before page 286.

Chr.

Chr. Acosta calls it *arbore de sancto Thome*, says it resembles our elm, and affirms "that there is no medicine, that with more propriety merits the name of *specific*; for, adds he, surely it was an *Angel* from heaven that first discovered this tree for the benefit of mankind, for it is much preferable to the *myrobolans*, to the *areca* and *coru*, medicines so long famous among the Indians for the dysentery."

The first knowledge we had of it in *Europe*, was in 1713; some of it was sent from *Cayenne* to *M. le Comte de Pontchartrain*, then secretary of state, as the bark of a tree, called *simarouba* by the natives, which they employed with good success in both dysenteries and fluxes.

M. Fagon, the King's first physician distributed it among the professors in the King's garden, where *M. de Jussieu* got some of it, which he employed to very good purpose in the above epidemic dysentery of the year 1718; he says that from *analogy*, and considering from whence most dysenteries proceed, he conjectured that it might be as effectual to stop those excesses of the menstrual discharges, women are so subject to in *Paris*, and which have been attended with some bad consequences, on account of the *alum* given to stop them, nor was he deceived: he has ever since prescribed it with

success in both cases. He orders 2 drams of this bark to be boiled in three half pints of water, reduced to a pint, which he directs to be divided into 3 equal parts; this quantity is sufficient for 24 hours; he prefers the decoction before the bark in substance; but as there may be some, who cou'd not so well take the decoction, tho' it is not disagreeable to take; so they may take it from 12 to 20 grains, made up in either a bolus or in pills, every 3 or 4 hours, as circumstances may require; it is to be rasped as *tobacco* is, when taken in substance. He assures that in 15 years experience he found the effects of this bark the same in all stubborn, bilious and bloody fluxes, which after the 3d or 6th dose of the decoction were stopped, without any pain or evacuation, either upwards or downwards, the urine only became more abundant, and some wou'd sweat. Those who were relieved by it affirm'd, that they perceived within them some kind of motion (supposed to be a conflict between it and the disorder), much like what others feel upon taking the *cortex*, when it suddenly stops an *ague-fit*.

When *simarouba* is boiled in water, it is seen to froth, and turn white like milk, and rise like milk going to boil; but when the decoction is cold, it is like pale small-bear.

From

From its bitter taste, and its turning the decoction white, we may reasonably infer, that this bark contains a saline principle, enveloped in a kind of balsam, to which is owing that calmness and serenity of mind patients feel, a sure presage of its speedy and salutary effect; it also checks almost instantaneously the blood mixed with the stools, and brings these soon to their natural consistence, and by that means removes the most stubborn fluxes.

Its bitterness on the palate may induce us to expect, it will restore the tone of the fibres of the stomach, and mend the appetite, as all bitters, and particularly the *cortex*, are known to do.

Notwithstanding all those good qualities, *simarouba* is found possessed of, it wou'd be ridiculous to expect, that upon all occasions, and without due preparation, it will be attended with those salutary effects ascribed to it: there is here as in many similar cases, a necessary circumspection required, which every pretender to physic is not a judge of, and for that reason, the best of medicines are every day observed to miscarry in their hands.

The analysis of Borage. 1734.

M. *Boulduc* took some of the decoction of this plant, and evaporated it to the consistence

fence of a syrup; it became very black, and seemed to contain a good deal of oily parts; having laid it by, it soon was covered with a thick skin, under which were a good deal of fine crystals, blended with others of an irregular figure: the first were a true *saltpetre*, as appeared by every experiment made with them; put on a live coal, they flamed, as *saltpetre* mixed with any sulphurous matter wou'd; and in effect, this *saltpetre* was covered with some of the oily matter of the decoction; when a *lixivium tartari* was poured on a solution of this *nitre*, it precipitated nothing, which is a demonstrable proof, that it is a perfect *nitre*, such as is made in all our *saltpetre* works. What remained of the decoction; after the *saltpetre* had been separated, was poured on quick lime, in order to separate the oily parts: this *residuum* was evaporated after. He had more crystals of *nitre*, and those more distinct and better formed than the first; and under them a good deal of *cubic crystals*, a true *marine salt*; for a solution of this salt precipitated a solution of *silver* in the *nitrous acid*, and formed instantly a *coagulum* with it, which washed and dried over the fire, became a *luna cornea*; *borage* therefore contains both *nitre* and a *marine salt*.

M. Boulduc took here again the *residuum* of his decoction, and poured it on new wood

wood ashes, and evaporated it after ; he had here more *saltpetre* than in the two former processes, which he conjectures was owing to the nitrous acid, which still adhered to the oily parts, and which it very readily quitted, to join the fixed salts in the ashes.

M. *Boulduc* willing to know what salts were contained in the ashes of this plant, he had it first dried in the shade, and calcined after : the first experiment he made with its *lixivium* was with syrup of violets ; he found it scarce changed the color ; he after evaporated this *lixivium*, and in a short time after it had stood in a cool place, he found a *tartarum vitriolatum*, in distinct well formed crystals. When he had separated these crystals, he set the liquor to evaporate, and when it was evaporated to near the half, he let it settle, where he found some *cubic crystals*, a true *marine salt*, which had still remained, notwithstanding the great action of the fire during the *incineration* ; the remainder of the liquor turned now the syrup of violets into a beautiful *emerald* color. By this process it evidently appears, that *borage* contains 4 different salts, *viz.* saltpetre, sea-salt, vitriolated tartar, and a fixed alkaline salt ; the vitriolated tartar did not formally exist in the plant, the *vitriolic acid* in this vitriolated tartar, was joined in the plant with the sulphur or *inflammable principle* ;

ciple; during the *incinération*, this sulphur exhales, and is consumed; the *vitriolic acid* thus abandoned, seizes the fixed salt of the plant, and with it composes a new salt, a *tartarum vitriolatum*, exactly as it is every day made in our laboratory with *lixivium tartari*, and the same *vitriolic-acid*. Borage is not the only plant that contains saltpetre. *Carduus*, chervile, pelitory of the wall, beets, wild cucumbers, and many others are known to contain *nitre*, and probably those other salts borage on its analysis yielded, were they treated in the same manner.

The use of Polygala Virginiana in pleurifies, and from analogy of the use of the Polygala Vulgaris, in the same disorders. 1739.

M. Tennent informed the academy in 1738, that he had found the *polygala virginiana* very serviceable in pleurifies and peripneumonus, in either decoction or powder; its effects were diuretic, diaphoretic, cathartic, and sometimes emetic, but he prevents the two last operations, by giving any of the *testacea* with the powder, in simple cinnamon water.

When the case is a genuine pleurisy, he lets blood in the beginning, and repeats it after, if there is occasion; but in a nervous or bastard pleurisy, he neither bleeds nor blisters, but depends on this root, which he affirms

affirms scarce ever failed to make a cure, and that in some desperate circumstances; he prefers the decoction before the powder.

Messrs. *Lemery* and *de Jussieu* were appointed by the Academy to make trials of this root; they confirm'd what M. *Tennent* had said of it: they observed, that when it was given in infusion, it wonderfully promoted expectoration.

From this favourable report of the virtues of the Indian *polygala*, it was conjectured the *polygala vulgaris* C. B. might be possessed of similar virtues. M. *du Hamel*, willing to try this European *polygala*, and as this root is so very small, as it is difficult to get a sufficient quantity of it, he employed the whole plant with success in a violent pleurisy and spitting of blood: the ptisan was made with grass root, liquorice root, flowers of colts-foot, and a good handful of *polygala*, roots and leaves; the patient drank at will to slake her thirst, which was very great: in the afternoon she began to expectorate freely, the pulse became softer and more regular; at night, she took some spoonfuls of a syrup, made with the same *polygala*, and in about two hours after, she fell into so profuse a sweat, that she wet even the bed under her: the next day, the 7th of her illness, she was almost without a fever or cough; the 8th she had a flux, which

prevented her taking phisic ; but she was up the 9th, had her appetite, and was purged the 12th, the 15th she went abroad to follow her usual employment.

M. *du Hamel* did not find, that this plant occasioned any *nausea*, much less did it purge, as *Gesner* said it did.

M. *Bouvard*, who had in 1744 a considerable quantity of the Indian *polygala* given him, to make further trials of its virtues in pleurifies, confesses he was apprehensive of its too great heat and action, as a purgative in those inflammatory disorders, tho' he was no stranger to the practice of giving gentle purgatives in pleurifies, perigneumonies, especially in the winter season : these his fears made him try it first in dropfical cases, where such evacuations are both indicated and necessary. Accordingly he chose a patient, that had an universal *anasarca*, and who was besides dropfical, short-breathed, and had a fever ; he ordered an ounce of this root to be boiled in a *Paris* pint of water, reduced to the half ; the patient took every hour 3 spoonfuls of this infusion : he made in the day 3 *Paris* pints of urine, had besides copious discharges by stool, and when M. *Bouvard* visited him in the evening, he found him in a considerable sweat, which is not common to dropfical people, especially in so cold weather, as it then was (January) ;
the

the patient complained of no other inconvenience from those large evacuations than a little lassitude, which was well over by the next morning; hereupon the swelling of his face and hands fell greatly, his belly was a good deal less and soft, his pulse became less frequent, and his breathing less laborious; the same quantity of the infusion was repeated the next morning, which was attended with the same effect: the evening after, his breathing was so free, that he now cou'd lie on his back, which he cou'd not before, without being disturbed with a violent cough, his fever was almost quite gone, the lower extremity became of their natural shape, nor was there any fluctuation to be felt in his belly; in 7 days after he took a 3d dose, which intirely took off his fever and swellings; this and some other trials made with this root leave no room to doubt of its being serviceable in dropfies.

The dropfy is owing generally to some obstruction in the *viscera*, the lymphatic vessels are thereupon over distended, the lymph oozes thro' their coats, or these are ruptured; the true indication in such cases is to attenuate the obstructing lymph, and promote its discharge by urine, or stool; by which means what is extravasated will be the sooner taken up by the absorbent vessels, to be evacuated after by the proper

outlets: it was with this view that physicians in all ages, have recommended diuretics, and the strongest purgatives in drop-sies. *Polygala virginiana* seems, in a more especial manner to possess both qualities; its acrid and aromatic taste bespeaks its being a powerful attenuant, proper to incise the fizy lymph; as a stimulating medicine, it promises to evacuate the stagnating or extravasated *serum*, both by urine and stool, with this singular property, that it considerably abates the fever and thirst, relieves the difficulty of breathing, which all other strong purgers are known to increase.

But as the chief virtue of this root was said to be in pleurifies, &c. so M. Bouwart made likewise trials with it in those disorders; the first trial was made on a man of 50, who was 3 days ill of a pleurisy; he was greatly oppressed, had a sharp pungent pain in the right side, and a severe cough, he spit with difficulty, and what he spit was highly tinged with blood, his pulse was hard and quick, he complained of a general lassitude.

As this man had a rupture, M. Bouwart ordered he shou'd take a spoonful only of the infusion of this plant every half hour, to prevent its vomiting him; by this means the medicine purged him only, he also made plenty of urine.

But

But what is here very extraordinary, the fever, which in all inflammatory cases is observed to return in the evening, this root not only prevented the return of the fever, but took it off intirely, while at the same time it emptied the patient considerably, which all other purgatives are always known to increase; this is not all, his breathing was greatly relieved, his expectoration became free and easy, and his stitch was intirely removed; this same medicine was repeated the next day, it purged less, but evacuated plentifully by urine, and by the 6th day, his fever and all other symptoms disappeared.

M. *Bouvard* gave it to several others in the same circumstances, and always with the same good effect nearly.

M. *Bouvard* conjectures, that the virtues of this Indian root in all inflammatory cases is chiefly owing to its inciding qualities, no other emetic or purgative medicines are known to be attended with the like success, and were they given before previous and copious bleeding, they wou'd rather increase than diminish the fever, difficulty of breathing, &c. this is what happens, when the *kermes* has been given, before the fulness and tension of the vessels had been previously taken off, by copious bleeding, and plenty of diluting draughts; it is herein this *exotic*

tic has so considerably the advantage of all other purgatives ; it attenuates the fizy lymph, and evacuates it after ; for when things seemed at the worst, about the 4th day, it was found to relieve the breathing, promote expectoration, abate the fever in a most surprising short time : this *exotic* has justly that specific quality M. *Tennent* ascribes to it, of inciding the fizy lymph, in so much that in a few hours after the patient has taken it, he begins to spit freely, and some have even a kind of a *ptyalism*, as if they had taken *calomel*. The copious discharge by urine, the relief in the breathing, the removal of the tinged spits, the ease from the stitch and cough, all constant effects of this *exotic*, are incontestable proofs of its acting upon the blood and lymph, as a powerful attenuant and incider.

What further proves its action on the blood is that copious discharge by urine, a thing uncommon with other purgatives ; it is probably owing to this large discharge by urine, that the fever is so much abated, the pulse so calm in the evening, after taking this medicine, while all other purpatives are known rather to increase it.

M. *Tennent* considers this attenuating quality as its chief virtue, M. *Bouvard* herein differs from him ; he thinks if this plant did not evacuate so plentifully, both by urine
and

and stool, this specific inciding quality wou'd prove very detrimental in pleurifies, &c. for so powerful an attenuant, by inciding the stagnating lymph, this returning oftener in a time given to the common stores, the blood, the vessels must of course be by that means the more distended, the stitch, difficulty of breathing, and fever must likewise be increased, all which are happily prevented, by its evacuating this stagnating lymph, in proportion as it attenuates and divides it.

M. *Tennent* confesses that he was obliged to have recourse to bleeding, when the fever increased, upon giving this *exotic*, which evidently shews, this was owing to a rarefaction of the humors, which were not properly carried off; M. *Bouvard* observed, that when he gave this plant in powder, it did not evacuate the patient, and what is more, he then complained it heated him, and increased his fever; and ever since M. *Bouvard* gave it in decoction, which has not been observed to have the same effect.

M. *Tennent*'s decoction M. *Bouvard* thinks is too strong, he boiled 3 ounces in 3 pints * of water, reduced to one half, and ordered 3 spoonfuls every 6 hours. *Bouvard* orders the same quantity every 3 hours, but his

* There is here some mistake, it should be 2 pounds of water.

decoction

decoction is weaker, an ounce boiled in a *Paris* pint of water reduced to one half. tho' this decoction evacuated so powerfully with them in winter, it does not follow it shou'd do so in warmer weather; and when that is the case, he thinks it shou'd be given in a much less quantity, that it may act as a gentle incider, and wou'd even advise a bleeding or two, to prevent the rarefaction of the blood and distention of the vessels.

And here it is to be observed, that in most inflammations of the breast, that happen upon the setting in of the cold-weather, emetic or emetico-cathartic draughts are not only necessary, but absolutely so in the beginning, to evacuate the great *cacoehylia*, heaped up in the bowels from excesses in fruit, &c. during the autumn, and the diminution of the cutaneous secretions at this time; it is in such cases the *polygala virginiana* will do wonders, while it requires as great circumspection in its use in the same cases in summer, where the skin is dry, the pulse hard, and all the juices as it were baked up. But when the body is loaded with crude indigestions, the copious discharges it promotes, both by stool and urine, may amply supply the place of venesection in winter pleurifies.

M. *Bouvard* thinks it wou'd answer well in

in the humoral *asthma*, and in many other lymphatic disorders.

M. *Bouvard* concludes, it is pretty extraordinary that M. *Tennent*, who from observing that this plant was a specific in the bite of the *rattle-snake*, and so judiciously applied it to cure pleurifies, never thought of giving it in the inflammatory, or gouty rheumatism, where the blood drawn is like that of pleuritic folks, and which is cured by repeated bleedings, as pleurifies are; this plant might therefore be there employed with the more confidence and less danger, as none of the noble parts are affected*.

Of Amber. 1700. 3. 5. 42.

It has been commonly believed that the *amber*, found in the *Dantzick-sea* was a *gum*, that exuded from certain trees situated on the borders of that sea, where by the collision of the waves and heat of the sun, it acquired that hardness we find it in; but M. *Tournefort* in 1700, received some accounts from *Aix* in *Provence*, that yellow *amber* was found in the most bare and barren rocks of that *province*. From this time the academy

* Had M. *Bouvard* seen M. *Tennent*'s letter, concerning the *Seneca rattle-snake root*, he would have spared this censure; for M. *Tennent* not only recommends the *Seneca snake-root* in those more acute diseases, but is also fond of it in the *rheumatism*, *dropsy* and *gout*, in which last disease, he says, he has given it with success. See *Edin. Med. Ess.* vol. vi. p. 377.

seemed inclined to consider *amber*, rather as a mineral than a vegetable substance, and that the *amber* found in the *Dantzick-sea* did not fall into it from trees, but was conveyed thereto from some subterraneous places, by inland floods.

M. *Galland* of the academy of inscriptions, confirmed in 1703, the accounts of *amber's* being found in Province; for he found it on the borders of the sea, near *Marseilles*, where there were no trees, of course it must have flown thro' the cliffs of the rocks of those rocky, barren places.

In 1705 the *Marquis de Bonac*, the King's ambassador extraordinary to the King of *Sweden*, upon seeing some *fossil amber* dug out of the grounds of M. *Grata*, post-master-general to the King of *Prussia* near *Dantzick*, which was of the same kind with what is found in those seas, began to reflect, that this substance cou'd not be formed by the froth of the sea, as it was then generally believed; the *Cardinal, Primate of Poland*, who was then present, advised the consulting the R. Academy; accordingly M. *de Bonac* wrote to know their opinion concerning this matter; the academy, always careful not to pronounce too hastily, before they received full information, so as to enable them to determine the matter to their satisfaction, wrote to the *Marquis*, that by all
the

the accounts they had hitherto received, concerning *amber*, it was more than probable, that it is a mineral substance; for by the accounts of people of credit, it is found in the cliffs of rocks in several parts of *France*, it is likewise found along the coast of *Agrigentum*, *Catanea* and *Leocata* in *Sicily*, in the Island of *Corfica*, and even about *Bologna*, in *Umbria* and towards *Ancona*, places far distant from the sea. They at the same time reminded the *Marquis* of his seeing it dug out of M. *Grata's* grounds, divided from the sea, by a large wood and some high lands, that there are often some terrestrial animals found in it, which denotes that it was first liquid, and probably as it flowed thro' the cliffs of the rocks, some of those insects might light on it, and be after enveloped in it.

As to trees producing this substance, they never received any account of any such trees being found in *Prussia*, and as to the *analysis* of *amber*, tho' it does not intirely determine its nature, whether a mineral or a vegetable, yet the oil of *amber* has all the appearance of a *bitumen*, which induces the Academy to look upon *amber*, as a *bitumen*, of course a mineral. Ever since this time 1705, *amber* has been universally acknowledged to be a mineral production, composed of an acid and a *bitumen*; for the salt it

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yields

yields by its *analysis*, ferments with all alkaline salts, of course it is an *acid*. But it has not been hitherto determined what kind of acid it is; some said it was a vitriolic acid, by reason there were beds of a *vitriolic ore*, found in the same place where *amber* was found.

But the discovery of the nature of the salt of *amber* was reserved for the researches of M. *Bourdelin*; he has with indefatigable pains discovered, that the acid in *amber* is the *marine*, and not the *vitriolic acid*; for the figure of the salt of *amber* is the same with that of sea-salt, *cubes*; both have the same bitter taste and smell, both put on a live coal, decrepitate alike; when the oil of *vitriol* is poured on both, they equally exhale the odor of the marine acid; a solution of *sal succini* will precipitate a solution of silver in the spirit of nitre, directly as a solution of sea-salt wou'd, into a white *coagulum*, which evaporated after, becomes a *luna cornea*.

The same solution of *sal succini* did precipitate a solution of mercury; the precipitate here is white; whereas had the acid of *amber* been vitriolic, the precipitate wou'd be yellow, a true *turpetum minerale*.

These two experiments prove incontestably, that the acid of *amber* is the same as that of sea salt; for in the first place, it is well

from the ROYAL ACADEMY. 309

well known, that no other acid will precipitate a solution of silver into a white *coagulum*, which upon evaporating it after, becomes a *luna cornea*, but the marine acid. 2^o. It is likewise known, that no other acid will precipitate a solution of mercury in the spirit of nitre into a white precipitate, and sublime with it after, but this same marine acid; the acid therefore in *amber* is the marine, and not the vitriolic acid*.

A further inquiry into the nature of Amber.

Tho' *amber* has been so long known, and so long in use, both for ornament and as a medicine, yet there is no natural production, whose nature and origin has remained so long unknown, and about which there has been so many various, and even contradictory opinions.

Philemon, an ancient naturalist, before *Pliny's* time, ranged *amber* among the *fossils*, and established two sorts of it, the one *white*, the other *yellow*, and assured they were extracted out of two different mines in *Scythia*. *Pliny* who relates this account of *Philemon*, deprives *amber* of its *fossil nature*, and makes it the *gum* of a tree.

Diascorides calls it the rosin of the poplar-

* *M. Pot* has given a curious set of experiments on this singular salt, from which it plainly appears its acid is essentially different from the 3 mineral acids, but approaches nearest to the vegetable acid. See *Neum. Chem.* p. 237, Note y.

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tree,

tree; in his account of the black poplar-tree, he says, "it is reported that their tears running into the River *Po*, condense and become what they call *amber*." Most of the ancients were of the same opinion, that upon the tears of poplar-tree's falling into the *Po*, they there concreted, and so became *amber*; for all the tears of the poplar-tree are not turned into *amber*, but such only as fall into the river, and are there hardened, by virtue of the cold water. But of all the opinions of the ancients about *amber*, the *Arabians* seem to approve of that alone, which, deriving its authority from the fable of *Phaeton*'s sisters being changed into poplar-trees, makes it to be the tears of the black poplar: the truth of this they assert every where in their writings; this much is certain, that the black poplar-tree exudes a kind of *gum*.

About 1500 years after *Pliny*, *George Agricola*, one of the greatest naturalists of his, or of any other age, restored *amber* to its *fossile state*: this author in his treatise *de Natura fossilium*, looks upon *amber* to be a mineral juice, and does not hesitate to range it among the *bitumens*; notwithstanding that his opinion has met with the suffrage of most naturalists since his time, yet there have been some very late authors *, founding their

* Doctor *Fothergill* has a paper to this purpose. *Phil. Trans. abrid.* vol. x. pt. 2. p. 77.

opinion

opinion on some false accounts, who wou'd still have this a vegetable substance, and pretend that *amber* is the *gum* of the poplar-tree, which by the collision, &c. of the waves of the sea is so prepared, as to become what we call *amber*, in the same manner, as *gum-copal*, (a gum of the poplar-tree) is found prepared in nearly the same manner at the *Antiles Islands*, and which, besides the great resemblance it has to *amber* in its color, yields the same principles by its *analysis* as *amber* does.

It wou'd be endless to relate the various opinions of writers concerning the nature of *amber*; as to what we are told of the *King of Prussia's* having a convex, transparent *mirror* made of *amber*, among the curiosities of his cabinet, and what *Hartman* says, of mortars being made of it, they merit no sort of credit.

As to the mineral nature of *amber*, *Fr. Hoffman* has put this matter beyond all manner of doubt; "the earth," says he, "that
" rich store-house of *nature*, contains in its
" bowels, not only metals, minerals, stones,
" earths, salts of various kinds, but also che-
" rishes within its bosom, bodies of a sul-
" phurous, unctuous and tenacious sub-
" stance, which pass under the name of *bitu-*
" *tumens*; the principal distinction of which
" is into *noble* and *ignoble*; both are of a dry
" and

“ and liquid form : of the noble kinds are
“ *ambergrise* and *amber*. *Prussia*, continues
“ *Hoffman*, is the native country of *amber*,
“ it is found there in great plenty ; what
“ is found on the sea shore is wasted out
“ of the bowels of the earth, in the tempestuous agitations of the waters.”

“ The King of *Prussia* ordered some years
“ ago to dig, in order to discover those veins
“ of *amber* ; the first thing they met with
“ was sand, and under it a *stratum* of white
“ clay, under which they found a ligneous
“ *stratum*, that seemed to be compacted
“ wood : under this they found in most
“ places a *vitriolic ore*, which when exposed
“ to the air, was covered with efflorescences,
“ free from the least mixture of copper ;
“ at last upon digging deeper, they hit upon
“ a *stratum* of sand, out of which they dug
“ up abundance of choice *amber* ; after the
“ same manner they dig it out of the sand
“ in the *Marquisate* near *Kustrin*, and in the
“ territories of *Stolpen* and *Dantzick*.”

“ The salt of *amber* has this peculiar to itself, that it is volatile, tho’ an acid ; all volatile salts besides are alkaline ; all the chemists and dispensatory-writers, except *Lemery’s* course of *chemistry*, *Charas’s pharmacopœa*, and the *codex Parisiensis*, in giving the *analysis* of *amber*, tell us that the spirit comes over first, a fine oil after, a coarser oil comes next,

next, and the volatile salt last, which sticks to the sides of the retort; thus *Schroder*, *Etmuller* in his comments on *Ludovicus*, *Maurice* and *Fr. Hoffman*. *Boerhave* in his chemistry, the *London* and *Edinburgh* dispensaries and others, make the oil precede the volatile salt, which must be certainly owing to some very great inattention, or to those great men's making use of earthen vessels, which prevented their observing what happens in the *analysis* of *amber*. *Charas*, *Lemery* and the *Codex* make the *flegm* or spirit come over first, the volatile salt after, and the oil last of all.

If matter of fact cou'd stand in need of any arguments to enforce it, this simple reflection wou'd suffice to convince us, that the volatile salt in the *analysis* of *amber*, shou'd come over immediately after the spirit, and before the oil. It is agreed on all sides, that the spirit of *amber* is no more than the last portion of the *flegm*, which as it was coming over, had detached some particles of the volatile salt, as appears by the light impregnation of this spirit. Now, as this *flegm* cou'd detach some of this volatile salt, it thereby appears this volatile salt is opened, and ready prepared to rise, and as this salt is the same that came over in the *flegm*, it is more natural, as well as probable, that it follows immediately the

spirit, and rises before the oil, as *Charas* and others have observed, at least in the five processes of M. *Bourdelin's* it always happened so.

THE

THE
ANALYSIS

OF SOME OF THE

Principal Mineral Waters

OF

F R A N C E.

EVERY body the least conversant with
physical writers must know that many
and noted cures have been performed at all
times, and in all places, by mineral waters:
there is no one medicine in all the *materia
medica*, that has in all ages of physic been
found so generally effectual, or has so uni-
versally supported its credit, in the removal
of the most rebellious maladies as those sa-
native draughts, prepared in the bowels of
the earth, with which *bountiful Nature* has,
with a liberal hand supplied all the different
regions of this habitable earth; and though
probably chance had herein, as well as in
many other instances, the greatest share in
the first discovery of those healing springs,
and tho' their success in numberless instan-
ces has been abundantly confirmed by the
experience of many ages, yet it might still
be both advantageous and necessary to in-

investigate their native principles, the better to regulate their use, and distinguish the cases, wherein they might with greater prospect of success be recommended, by which means their use may be further extended, to the removal of several chronic cases, they were never yet employed in.

The Royal Academy was so sensible of this, that soon after their first establishment, they directed *analysis's* to be made of the principal mineral waters of *France*; it was pursuant to this plan that M. du Clos, one of their chemists, *analysed* most of those waters, brought from their several sources to *Paris*, in the years 1670 and 1671, and published his observations and account of them in 1675, in the name of the Academy. The Royal Academy however soon after their re-establishment in 1699, always attentive to the improvement of natural knowledge, directed those waters to be examined a-new, and that at their sources, with a view to the better regulating their uses, and in some cases artificially to imitate them, when they had more perfectly known their natural properties, by which means the physician may have it in his power, to save the patient the trouble and expence, and often the hazard too frequently attending the going to drink those waters at their source. We shall divide those mineral waters into three classes.

I. Class

I. Class will comprehend all the hot waters.

II. Class the tepid and saponaceous waters.

III. Class the cold, ferruginous or chalybeate waters.

The first class.

The waters of Balaruc, near Montpellier. 1699.

M. Regis, who went to *Balaruc* for the recovery of his own health, took that opportunity to examine those waters; he observes the vapor they constantly exhale, has somewhat of the odor of brimstone; to the touch they feel as hot as water going to boil; yet the drinker perceives no uneasiness from them; sorrel leaves infused in them remain green for a considerable time, and a new egg left in them $\frac{3}{4}$ of an hour is no more changed, than it wou'd be in the time in cold water.

Upon bathing in them, they raise so great a sweat, that one can't stay above $\frac{1}{4}$ of an hour in them; and when one drinks them, the skin feels soon after both smooth and unctuous, a manifest proof of their sulphur, tho' no one hitherto has been able to extract any from them; to the taste they seem brackish, not unlike sea-water, but not near so disagreeable.

By

By their *analysis* they appear to contain a volatile mineral acid, quite disengaged from any alkali ; for they turn a tincture of marsh-mallows red, but after these waters had stood exposed to the air awhile, or after they had been boiled, they wou'd make no change in the same tincture, so fleeting is this mineral acid ; sea-water, either cold or warmed made no change in the same tincture ; the sediment they left after evaporation, yielded an alkaline salt, which fermented with all acids, turned the above tincture green, but did not effervesce with salt of tartar ; half an ounce of the same sediment put into a retort, placed in a reverberatory fire, yielded without any additament, in a very short time 48 grains of a mild acid spirit.

The method of using them is this, patients either bathe in them, or drink them for 4 days successively ; they lie by for 4 days more, during which they neither bathe nor drink them ; custom has established this method.

Of the waters of St. Amant near Tournay.
1699.

M. Boulduc the father, *analysed* those waters ; by all the trials he had made, he cou'd not discover in them either an acid or alkali ; this wou'd induce one to think that
both

both these salts were in an exact proportion; they only turned lime water milky, and whitened a solution of lead in vinegar; upon evaporation they left a whitish kind of earth, in the proportion of 12 grains to the pound of the water, which as it dried appeared in shining spangles; these 12 grains contained 3 of marine salt.

M. *Morand*, who attended the King's household troops in 1743, took that opportunity to examine those same waters, of late become famous for the many noted cures they have performed.

Their modern date is in 1648, when the *Arch-duke Leopold*, then governor of the *Low-Countries*, received great benefit from them, yet some medals and statues, found in digging near those springs, evidently shew, they were well known to the *Romans*; the medals are of *Vespasian* and *Trajan*; they found likewise a little brazen altar, which had in *bas-relief* the principal story of *Remus* and *Romulus*; a little statue of the god *Pan*, several of *Cupid* and of others.

These waters are situated in a meadow; the soil near the springs consists of three different *strata*, the uppermost is a black mould, the next is a kind of marl, the under *stratum* is a fine sand which near the spring is moveable; the upper *stratum* visibly contains metallic particles, is heavy and hard, and when put into the fire, it casts forth

forth the odor of brimstone ; there are found under it *marcasites*, that contain veins of a sulphurious ore.

There are 3 sources of these waters, the first and second are manifestly sulphurious ; silver immersed in them is soon tinged with a yellow color, exactly as it wou'd be in the springs of *Aix la Chapelle* ; their surface, especially in calm weather, appears bespangled, which evidently betrays their sulphur ; they feel warmer than common water does in the hottest days in *July*. M. *Reaumur's* thermometer immersed in the source for ten minutes, raised the mercury half a degree ; they appear as smooth on the palate, as they are limpid and transparent to the eye, leaving a light taste of brimstone behind ; mixed with the powder of galls, they become of a light yellow color, but would not turn the syrup of violets green, nor did they suffer any change upon the admixture of spirits of wine, or vitriol, or of the tincture of *turnsol* ; but upon the admixture of *lixivium tartari*, they become muddy, of the color of *turnsol*, and let fall a little sediment.

What M. *Boulduc* said of these waters turning lime-water milky, and whitening vinegar of lead, is common to even simple waters : these waters are heavier than rain, and lighter than well-water ; transported to *Valencienne*, which is but 3 leagues distant, they

they retain very little of their sulphurous taste, and on the 5th day they did not appear to differ from common water; 8 pounds of these waters evaporated in a new earthen glazed pan, for the space of 12 hours, left 17 grains of sediment, which upon examination, appeared to be no more than a fine earth; it was insipid on the palate, nor did it betray any particles of iron, when presented to the *magnet*; this sediment put into distilled vinegar, fermented with explosion; a scum arose, like what all earthy substances are known to throw up; the vinegar dissolved a part of this sediment, the remainder dried, and examined by M. *Geoffroy*, was found to contain the acid of vitriol.

By all the trials M. *Morand* cou'd make with those waters, or the sand found in the bottom of the springs, he cou'd not discover the least *vistige* of an *iron-ore*, which is the more extraordinary, as there is a chalybeate spring within six yards of those sulphurous springs; the 2d spring is more strongly impregnated with the mineral; transported to *Valencienne*, it retained its taste for 8 days, and the same quantity of it evaporated as of the first, yielded 24 grains, which was both grayer and lighter than the above sediment.

This 2d spring which is called the fountain of *Arras*, being so much stronger of the

mineral than the first, (it generally sits too heavy on the stomach) the robust only are able to drink it; some mix the 2d with the 1st; others begin with the 1st and end with the 2d source. From M. *Morand*'s own experience of their effects, he thinks them cooling, diuretic and aperitive; their chief virtue is in the gravel, and all disorders of the kidneys. M. *Morand* excepts an ulcer of the kidneys, as he had observed they rather exasperated than relieved it; and as to their curing cancers, king's-evil, old gleans, stubborn tetters, &c. as is vaunted, he doubts they will not answer; he was an eye witness of their being taken to very little purpose in most of those cases.

The above chalybeate spring was not discovered till 1720; the soil about it is of an *ochery* color; the water leaves a stiptic taste on the tongue; mixed with the powder of galls, it becomes of a violet color, which gradually turns black; upon boiling it deposits a subtile yellowish earth.

This spring is greatly neglected; but M. *Morand* thinks it may one day come into vogue, not doubting but that those, who had not received benefit from the sulphurous, may from the chalybeate spring.

Near those sulphurous springs is a mud, which sends forth a smell like that of rotten-eggs, and that to a good distance: this mud

mud is no way hot, yet it is in great esteem with the country people, for drying up old sores of the legs, and of late to relieve weaknesses of the joints, swellings and *anchyloses*'s of the same; they also apply it in rhumatic and sciatic aches, &c.

M. *Morand* thinks the virtue of this mud is singularly beneficial, in removing the contractions of the tendons and nerves, that often remain after the cure of great wounds; he was an eye-witness of an extraordinary instance of this kind in a Dutchman, who after a wound he received, lost the intire use of his hand; but upon his applying this mud for some time, he intirely recovered the use of it.

The proprietors of this mud are so choice of it, that they will not permit any of it to be taken away; this excited M. *Morand* to investigate more narrowly the nature of this mud; upon examining the environs of those springs and mud, he found they abounded in *fossil-coal*, which every body knows is a kind of *bitumen*, highly impregnated with sulphur. M. *Morand* conjectures, that this mud owes all its medicinal virtues to this *fossil-coal*; to be satisfied in this matter, he made an artificial mud with some of this *fossil-coal* and water; he had the satisfaction to find, that his artificial mud had the same good effect the natural is known to have;

for having applied it to a tumor on the joint of the great toe, which was very painful, and had resisted all other topical applications, it was radically cured in 17 days time, by putting the foot two hours every day in it; another with an *anchylosis* of the knee, was in like manner cured in 3 weeks time, by the same artificial mud. A child who had an *anchylosis* of the elbow, complicated with a fistulous ulcer was cured by it; a 4th whose fingers were contracted after a wound he received in the hand, was so far relieved by it, as now to be able to stir his fingers.

What was at first but the result of conjecture only, happens to be confirmed by experience; patients may now substitute this artificial mud to the removal of those rebellious disorders, the natural sulphurous mud has been so long remarkable for, and save themselves both the expence and trouble of going so far for it.

And here M. Morand from *analogy* conjectures, that as this artificial mud has been found so effectual to soften *anchyloses's*, resolve hard tumors, so a ferruginous mud may, upon trial be found as effectual to strengthen, and brace up relaxed, over-strained, or otherwise weakened parts. *Provident Nature* has every where, in every street, provided this artificial ferruginous mud;
it

it is only raising the pavement, especially where the water is seen to settle; the black earth, always found there is fully impregnated with those ferruginous particles, which are constantly abraded and wore off the horses shoes, and all wheel-carriages; that this earth abounds with particles of iron is sufficiently obvious from the *iron-molds* seen on women's linen, and the purple dye given to scarlet cloth by the street-dirt.

M. Morand has not as yet made the experiment, but promises when a fit opportunity offers to communicate the success thereof to the Academy*; he here makes a judicious remark, that we too often despise, and heedlessly trample under foot many powerful medicines, which upon a fair trial wou'd be found to the full as beneficial as those dearly sought after, and want only to be brought from some distant place, and cost dear, to bring them into repute.

The waters of Bourbon. 1700.

M. Geoffroy the father, who went for his health to drink those waters, *analysed* them;

* M. Malaval has since made the experiment; he tell us, that a person had a swelled knee for a year and a half, which resisted every other topic applied, such as emollients, resolutes, the *douche* or pump, &c. assisted by proper internal medicines, whereupon he advised to apply this *black earth*, which soon removed the tumor; he further adds that he has often experienced the success of the same earth in sprains. *Mem. de Chirg.* vol. iii. p. 6.

at

at the source they are limpid, and a little brackish on the palate; the borders of the spring are always covered with a kind of sulphurous matter, the mud in the bottom is black and of a bad smell, they are so hot, that one cou'd not hold his hand long in them, without being scalded; they will scald a fowl, and boil eggs, tho' not to be hard, and sorrel leaves infused in them, are considerably altered in their color, yet the drinker perceives no uneasiness from their heat; the spring is covered every morning with a variegated scum; the waters at the source changed a tincture of turnsol into a faint red, but the powder of galls made no change in them, nor did a solution of corrosive sublimate, or of coperas or lime-water disturb in the least their transparency, but salt of tartar formed a *coagulum* with them.

M. *Burlet* analysed those same waters in 1707; he found they contained an alkaline salt, a marine salt, and a *bitumen* of the same nature of *petroleum*, which is ever inseparable from all such waters, as contain a marine salt. As those waters are not purgative, some mix them with the waters of *Vichy*, which are considerably so, and near the *Bourbon* waters. M. *Burlet* experienced the good effects of the *arcanum duplicatum* mixed with those waters, and what was very
remark-

remarkable, those who could not be purged with other salts mixed with those waters, were effectually purged by the addition of the *arcanum duplicatum*. There are 3 sources of those waters ; they all have been long in repute both for bathing and drinking ; they are found to be powerfully attenuating, to drive greatly by the skin and urine ; it is therefore highly incumbent on those, who either bathe or drink them, to avoid the inclemencies of the weather, especially the northerly winds ; the spring season therefore is by much the best time to use them ; in the after season or autumn, the weather is generally more changeable and uncertain.

Tho' those waters, in common with many others of the same kind, are very proper to dissolve a sily blood, and to restore the languid spring of the vessels, yet it must be confessed, that the success attending all mineral waters, depends as much upon a proper application of them, as on any inherent native quality they may possess ; for we but too often find, that the best medicines we know miscarry, nay often do mischief, merely by misjudging the Case.

Of

Of the waters of Bourbon Lancy, Bourbon l'archambaut, Vichy, Neris in the Bourbonnois; Mont d'or, Chaudes aigues, Bourbonle and Evaux in Auvergne. 1708.

All these waters contain the same principles, but in different proportion, viz. a *Natron*, or natural alkaline salt, nearly resembling kelp, and a pittance of a volatile sulphur.

All these waters have been found beneficial in all cold, decayed constitutions, when it was necessary to invigorate a vapid poor blood; to promote the several secretions; to restore the springiness of the several orders of vessels; but they should not be indiscriminately recommended to every body, nor entered upon by any without due preparation, and proper advice first taken.

M. *Burlet* was an eye-witness of fatal consequences thro' a neglect of the kind; a young councillor of parliament, who accompanied the President *Harlay* to *Vichy* in 1707, wantonly and without any preparation, drank the waters of *Vichy*, which soon after threw him into an incurable dysentery, of which he soon after died.

An asthmatic, who for some ten years before, used to spit up blood, died in 7 days drinking them.

One pound of the waters of *Bourbon Lancy*

cy yielded after evaporation 12 grains of a saline substance, of which 2 grains were earth.

One pound of the waters of *Bourbon l'archambaut* yielded 30 grains.

One pound of *Vichy* waters yielded 63 grains of the same substance.

It is owing to this greater quantity of saline contents in the waters of *Vichy*, that they are so much more active than those of both the *Bourbon's*; they are known to fuse and melt down the blood in a very short time, and very readily to bring on a fever; wherefore great circumspection is required in their use.

A pound of the waters of *Neris* yielded but 8 grains of the same saline substance, $\frac{1}{10}$ being a fine earth.

A pound of the waters of *Evaux* contained but 7 grains.

A pound of *Mont-d'or* waters yielded but 12 grains.

A pound of those of *Bourboule* yielded 45 grains.

And a pound of those of *Chaudes Aigues* but 8 grains, $\frac{1}{8}$ being pure earth.

M. *Boulduc* examined the waters of *Bourbon* in 1729, the Duke of *Bourbon* being advised to drink them this year for the recovery of his health.

At the source this water is as limpid and as clear as rock-water, without any smell,

but of a mixed taste, between a lixivial and a saline; when this water is set either to distill, or evaporate, a fine white pellicle is soon formed on its surface, which is easily destroyed; but upon continuing the evaporation, this pellicle becomes too heavy to remain long suspended, so falls to the bottom of the basin, in the form of cubic crystals, a genuine marine salt. This salt even before evaporation, manifested itself, 1^o. by its saline taste on the palate. 2^o. by precipitating a solution of silver and subliming it after, a property peculiar only to the marine acid; and tho' this salt seems to make up two thirds of the whole, yet from the inequality of the Crystals, it evidently appeared this sediment did contain more than one kind of salt.

To be certain of this, M. *Boulduc* dissolved this saline concretion in common distilled water, evaporated it after; it yielded more marine salt in fair cubic crystals, and after these were removed, the remaining solution exposed to the air, soon after deposited fair quadrilateral crystals, terminated at their *base* by crystals of the same figure; bitter first, and soon after cool on the tongue, which evidently prove them to be a genuine *Sal-Glauberi*, which *Lister*, and a great many others have mistaken for nitre; the cause of the deception is this; when this, as well as most other mineral waters are set to evaporate

rate

rate in the open air, or by the heat of the sun, this *Glauber's salt* is the only distinguishable salt to be seen, (all the other salts are covered with the earth found in all waters.) And as it has some faint resemblance in the length of its crystals to our modern nitre, this was sufficient to impose on some inaccurate analysers, so as to reckon nitre as one of the constituent salts of their waters, whereas the truth is, our nitre is never to be found in any mineral water. M. *Lemery* has incontestably proved that our nitre is either a vegetable or animal salt, which is produced only on the surface of the ground, at least not further than the first *stratum* thereof *, consequently can never be found in any waters, prepared in the bowels of the earth, as all mineral waters are. What remained of the solution, after removing the *Glauber's salt*, evaporated over a gentle fire, yielded a reddish pinguous substance, which plainly manifested both a lixivial salt, and a *bitumen*, which has hitherto been taken by most *analysers* of mineral waters for a genuine sulphur. This lixivial salt has been likened by some to our *Kelp*, or salt of glasswort, but M. *Boulduc* thinks it rather resembles the *natron* of the ancients; to be certain of this, he made a solution of of some of that earth, found about *Smyrna* and *Ephesus*, which as it is employed in

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those

those countries in the manufacture of soap, must be of an alkaline nature, and another solution of the alkaline salt found in those waters; he saturated both solutions with the vitriolic acid, both yielded a *Glauber's salt*. It is obvious from this experiment, that the alkaline salt of those waters, is the same as the *matrix* of marine salt, consequently the alkaline salt of both the waters and said earths owe their origin to sea salt, and as to the pretended *sulphur* of those, and all other hitherto reputed sulphurous waters, it is a mere deception, owing to want of accuracy in the observer, who upon casting some of the saline concretion, obtained by evaporation from those waters on an ignited iron, especially in a dark place, took the bluish flame, that then appeared as a sure sign of those concretions containing sulphur, the more so as he fancied it exhaled an odor, somewhat like what exhales from burning brimstone; but had there been any sulphur in those waters, the alkaline salt they evidently contain wou'd presently unite with it, and thereby give those waters both a rotten taste and smell, not unlike what exhales from a solution of *hepar sulphuris* in water; but those waters have neither such a taste nor smell; besides, had there been any such sulphur in those waters, upon adding oil of vitriol to them, this sulphur wou'd

would precipitate ; the vitriolic acid being the most powerful acid we know, wou'd presently detach this sulphur from its alkaline salt, and upon joining it, the sulphur wou'd precipitate and be found in the bottom of the vessel, in its own genuine form ; but no such precipitation ever happens upon the admixture of any acid with those waters ; consequently those waters do not naturally contain any sulphur : But what is more probable is this ; those and all other waters that contain sea-salt, which is known to be bituminous in its nature, bring along with them a *bitumen*, hitherto taken by many for sulphur ; this *bitumen* is kept ever after in a dissolved state by the alkaline salt, indisputably contained in those and all other mineral waters, and on that account, this *bitumen* is never found floating on the surface of the water, but is always kept intimately blended both with the water and all its saline contents.

That there is a *bitumen* contained in all mineral waters will evidently appear by pouring spirits of wine upon the reddish pinguous residue, all mineral waters leave, after their evaporation ; this *bitumen* will be found floating on the spirits of wine, which might be had separate, in a pure white substance, by drawing off the spirit, or by evaporating it over a gentle fire.

Upon

Upon the whole then, M. *Boulduc* has been able to demonstrate the existence of the following salts, in those waters, viz. sea-salt, of course a *Glauber's salt*, a *mineral alkali*, a *selenites*, an *absorbent earth*, and a pittance of *iron*.

So many powerful salts intimately blended in a water so very hot, must necessarily be very proper to incid and resolve such humors as stagnate in the vessels, and effectually deterge the same; but as those waters are not purgative in their own nature, they require to be assisted now and again, by some convenient salts, to forward their operation.

Of the waters of Mont d'or. 1744.

M. *le Monnier* analysed those and some other waters of *Auvergne*; he found they contained the same principles M. *Boulduc* discovered in the waters of *Bourbon l'archambaut*, viz. a marine salt, a *Glauber's salt*, a mineral alkali, a *selenites*, a pinguous and bituminous substance; the sole difference between them seems to be, that the waters of *Bourbon* contain more of the marine salt and *selenites*, those of *Mont d'or* more of the mineral alkali and *bitumen*; but he could not discover any particles of iron in them.

There are at *Mont d'or* 3 springs, which probably proceed from the same source. Those waters just taken up, taste somewhat tartish,

tartish, and take one by the nose, as tart bottle beer wou'd. This flavor soon wears off, the waters taste fade and lixivial, after which is very disagreeable to several persons; they have no sensible smell, except somewhat of a lixivial one, which becomes more sensible, when one goes into the bathing room. As to their heat, *Farenheit's* Thermometer stood at $36\frac{1}{2}$ degrees above the freezing point.

It is here as well as in many other places, very remarkable to find a chalybeate spring within 2 or 3 yards of the warm spring, which from its effects seems to be impregnated with the same saline contents. At *Bourboule*, a league from *Mont d'or*, such another cold spring rises almost under the hot spring, there being but 4 foot distance between both the hot and cold springs.

Tho' from the taste of those waters, one shou'd be inclined to think they contain an acid quite disengaged, yet they do not afford the least *vestige* of their containing any such acid; for they wou'd not turn blue-paper red, or the tinctures of *turnsol* or violets green, nor excite an ebullition with *lixivium tartari*, but the reverse; for upon mixing a few drops of the oil of vitriol, they fermented considerably, as any liquid saturated with salt of tartar wou'd. They did the same with the marine, nitrous and vegetable acid; they gave the syrup of violets diluted
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in a little water, as bright a green color as the best *lixivium tartari* wou'd, and with the powder of galls, they became of a brown color ; upon pouring some of those waters on ink, made with a solution of copperas and galls, they rendered it clear, by precipitating the copperas.

M. *le Monnier* observed exactly the method M. *Boulduc* employed in evaporating the waters of *Bourbon*, and made the same experiments upon every distinct parcel of the sediment, and had the same kinds of salts in every one of them, which makes it unnecessary to repeat them here.

There is this remarkable in those baths, that tho' they raise so considerable a sweat, yet they are not observed to weaken, much less sink the spirits of the bathers, tho' they had continued them for 20 days successively ; whereas domestic baths, tho' they never raise a sweat any way so considerable, yet they are always found to sink the spirits greatly.

Those waters are found serviceable in rheumatisms, sciatics, palsies, they are known to deterge and consolidate old ulcers, to resolve white swellings, hard tumors, and to relax all contractions of the tendons and nerves ; the *douche* also or pump is here employed to very good purpose in all contractions

tractions of the joints, to soften and remedy *anchyloses's*, &c.

M. *le Monnier* was an eye-witness of a surprizing cure in an old laboring man of 60, who came quite double to these waters, owing to a rheumatism he had for near 10 years before; he had himself carried to *Cæsar's bath*, being unable to assist himself, and after he had taken 6 baths, he was able to dress himself, and walked after to the church without any assistance.

Of the waters of Barege. 1747.

Those waters are situated in a pleasant valley in the Pyrenean mountains; there are 4 baths, the hottest of which is called the Royal; *Fahrenheit's* thermometer stood in it at 113 degrees. It is so hot that no body cou'd stay above 8 minutes in it, and for that reason it is only applied as a *douche*, i. e. by way of a pump, to resolve all exterior tumors, to relax all contractions of the tendons and nerves.

The degrees of heat in the other baths, are as 100, 95, 90.

One may bathe in the bath of 100 degrees for half an hour, without perceiving the least uneasiness, or raising the pulse.

M. *le Monnier* who analysed those waters, made also experiments on himself, first in the Royal bath; he tells us that after 6 mi-

minutes, the sweat ran in streams down his face, his whole body at the same time was both very red, and considerably swelled; at the 7th minute he began to feel extraordinary agitations in himself; his pulse now was both very quick and full; at the 8th minute he perceived so great a confusion in his head, that he was obliged to come out of the bath as fast as he cou'd; he here had himself weighed, to see how much he had wasted during the 8 minutes; he found he had lost 20 ounces and 2 drams in that time: he immediately after went into the temperate bath of 100 degrees, where he remained 22 minutes; and weighing himself after, he found he had lost 8 ounces 6 drams, making in the whole 29 ounces in 30 minutes: if he cou'd have staid the half hour out in the Royal bath, he wou'd have wasted 76 ounces in that time.

M. *le Monnier* bathed often after in the bath of 100 degrees; upon an average, he found he generally wasted from 14 to 18 ounces in half an hour, tho' he never sweated; his breathing was no way affected, nor was his pulse raised; tho' it was stronger and fuller. Upon examining the quantity of his natural perspiration for half an hour before and after his going into the bath, he found upon an average it amounted to
about

about half an ounce in half an hour. M. le Monnier has often drank of the source of 100 degrees to the quantity of two Paris pints, yet he never found them to load his stomach, or provoke or raise a sweat, nor did he find he had rendered more than 8 by urine; he confesses he at the time both bathed, and took great exercise in herborizing on the adjacent hills, which might probably help their going off so much by the skin.

When one goes into the bath-rooms, he presently perceives a light, tho' not disagreeable odor of a *hepar sulphuris*; upon approaching to the nose a glass of those waters, just taken from the source, one sensibly perceives the same kind of smell, that exhales from an egg boiled hard, whose shell was just taken off: this water appears soft on the palate; to some it appears insipid, and for that reason they feel some reluctance on drinking it. They are so balsamic and free from any acrimony, that instilled into the eye, or even into any fresh wound, they give no manner of uneasiness; to the touch they feel saponaceous.

M. le Monnier made here all the usual trials, viz. with the powder of galls, tea-leaves, balusts, tormentil-root, &c. these made not the least change in the transparency of those waters, whereby one might suspect

their containing ferruginous parts; the syrup and tincture of violets, tincture of turnsol, neither acid nor alkaline salts, nor the solution of corrosive sublimate, nor *lixivium calcis*, cou'd disturb their transparency. A solution of *saccharum saturni* rendered them a little muddy: there appeared after a light white cloud, which precipitated after.

M. *le Monnier* evaporated 60 pounds of those waters, which he reduced to the quantity of 2 pounds, in order to examine them with more convenience at his return to *Paris*; upon examining this evaporated water after, the mineral acids fermented but feebly with it, nothing did precipitate, and nothing like the vapor of *hepar sulphuris* exhaled, upon the admixture of those acids, which cou'd not be the case, did those waters contain a sulphur, as is too fondly believed: he evaporated the remainder over a gentle fire; observing M. *Boulduc's* method, whenever he found the matter disposed to crystallize, to take off the bason, to see what kind of salt began to crystallize, this first sediment gave no signs of its containing any salt; it was like that fine foliaceous substance, found in the channel of those waters. It wou'd not ferment with oil of vitriol; put on an ignited iron, it exhaled a bituminous odor only.

He

He proceeded to a 2d evaporation, and when he perceived no more wou'd precipitate, he here again removed the bason from off the fire. What had now precipitated resembled dried *Argilla*; it was cracked in several places, and exhaled a strong lixivial smell; it fermented violently with oil of vitriol, exhaling the odor of the marine acid, blended with that of a volatile sulphurous acid: when he put some of this sediment on a live coal, it melted, turned black, and exhaled as strong a smell as so much burnt leather wou'd; it did not in the least decrepitate, so as to give the least sign of its containing a marine salt: he evaporated it a 3d time; he cou'd not here, no more than in the former evaporations, observe on the surface any saline pillicle; as soon as it began to turn muddy, it suddenly became as thick as honey, and as it dried, it swelled like salt of tartar, exhaling at the same time a strong urinous smell; this saline concretion attracted the air a little; on the palate it had the taste of a mixture of sal-ammoniac and marine salt, joined with a very great bitterness, and when any of it was put on a live coal, it exhaled a strong smell of burnt wool: all this time, there was no decrepitation, but one part melted very quickly, the other turned black, and remained in the form of a coal. The oil of vitriol fermented
more

their containing ferruginous parts; the syrup and tincture of violets, tincture of turn-sol, neither acid nor alkaline salts, nor the solution of corrosive sublimate, nor *lixivium calcis*, cou'd disturb their transparency. A solution of *saccharum saturni* rendered them a little muddy: there appeared after a light white cloud, which precipitated after.

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more

more violently with this 3d sediment than with any of the former, and raised with some violence a good deal of vapors, which manifestly contained the marine acid *; this mixture left exposed to the air, run into a *deliquium*, in which was found a *Glauber's salt*; no part of these sediments presented to the magnet after calcination afforded any signs of their containing any ferruginous particles.

As the waters of *Barege* contain so few saline parts, so they are not purgative, nor do they even go off by urine near so well, as other more saline waters are known to do; but in recompense of this, they are found to go off very readily by the skin.

These waters are long noted for relaxing all rigid fibres, contractions of the tendons, and nerves, by this means the secretions are restored, as well as the appetite, by relaxing the crisp fibres of the stomach.

Second

* It is here pretty extraordinary that this gentleman cou'd never discover a marine salt in any of his different sediments, the more so as he confesses that upon pouring the oil of vitriol on both the 2d and 3d sediment, the odor that exhaled was sensibly that of the marine acid: I apprehend there has been some inattention in this affair, *Mr. Boulduc* upon his meeting with sea-salt first, did not doubt but he wou'd also find a *Glauber's salt* after; and when in another experiment the *Glauber's salt* first appeared, he was certain of finding sea-salt in the next sediment, the *basis* of both being the same†; besides, the *bitumen* always accompanies sea-salt, the one is never without the other, and there is a *bitumen*

† See hereafter the analysis of Passy-waters.

Second Class.

Of the tepid and saponaceous waters. 1713.

The principal of those are, of *Faude*, *Champ des Pauvres* and *Beaurepaire*, all 3 near *Clermont* in *Auvergne*. *M. Chomel*, who analysed those waters, obtained by evaporation from a pound of each of those springs about 13 grains of a saline sediment, which he suspects contains a nitre and a volatile sulphur, which soon exhales; and he thinks this was the reason why *M. Duclos* cou'd never discover any sulphur in those waters; for it exhales and is lost long before they cou'd arrive at *Paris* for him to make his experiments with.

The waters of *Vic-le-Comte*, of *Matres de Veyre*, *Cornet*, are more impregnated with the

here. What our author says of their virtues is every day confirmed; I have been an eye-witness in 1752, of many noted cures performed by them; crowds of officers and soldiers resorted thither for relief from those excruciating pains, which often remain after great wounds, and as often are owing to splints of bones, pieces of their cloths, &c. left in the wound thro' hurry in a day of battle. In a neighbouring village called *Coterez*, there are 5 or 6 springs, to all sensible appearances of the same qualities; they have been known to the *Romans*; these are this day noted for stopping all kinds of hemorrhages, detarging all internal ulcers of the lungs, kidneys, &c. I have seen some, who on their first coming, appeared to be in the last stage of a consumption, recover their florid complexion, others greatly emaciated by drinking those waters with goat's-milk, soon regained their *embonpoint* to their own and every body else's great surprise; these waters are not purgative; they all deposit at the source a fine whitish, foliaceous substance, by the drinkers called their sulphur.

same

same principles, than the foregoing. A pound of those waters left after evaporation about 35 grains, which besides nitre, seemed to contain a pittance of sal ammoniac. A pound of the waters of *Nectair*, yielded 18 grains, $\frac{3}{4}$ of which was a calcarious earth; the remainder consisted of a marine salt and nitre; a pound of the waters of *Chatelguyon* yielded 53 grains, one half was a calcarious earth, the other half in M. *Chomel's* opinion, was an alkali and nitre: all the above waters are in *Auvergne*.

Of the saponaceous waters of Plombieres in Lorrain. 1746.

M. *Malouin* analysed those waters all manner of ways; the source is perennial, nor was it ever known to be frozen; it has this great advantage over most waters, that it is very agreeable to drink, no small circumstance in its favor, where helps of this kind are to be continued for a considerable time.

They are allowed to be softer than the waters of the neighbouring hot sources; they lather perfectly well with soap, and the inhabitants of *Plombieres* prefer them before any others to bleach their linen; it is further remarkable that several *hepatic plants* grow about this spring, which are not seen in any of the other mineral springs, either cold or hot; such as the *Lichen Petræus*, *sive hepatica fontana Tragi*. Those waters mixed with

with milk, prevent its curdling, nor will it turn it when added to boiling milk.

Those waters suffer no change from the tinctures of violets, galls, nor from any acid or alkaline salts, whether fixed or volatile, nor wou'd a solution of corrosive sublimate disturb their transparency, it only formed a kind of cream on their surface, which was easily known for their *bitumen*; this cream turned copper white, and as the water evaporated of itself, it left a coffee-color-like sediment, which put on a red coal, immediately took fire, exhaling the odor of *bitumen*; it is this *bitumen* that prevented the alkali in those waters from turning the corrosive sublimate into a red orange color, but here it became of a coffee-color.

M. *Malouin* from those trials looks upon those waters to be a composition of a fixed, alkaline salt and a *bitumen* of the nature of *petroleum*; and to be convinced of this, he repeated the same experiments with an artificial soap-water, the result was exactly the same; he poured a solution of corrosive sublimate on this soap-water; it no more disturbed its transparency than it did that of the mineral water, but formed with it the same kind of cream, with this difference only, that with the soap-water, this cream was yellowish, with the *Plombieres* waters of a variegated color. A solution of silver

in the nitrous acid rendered those waters first muddy, then of a yellowish white, and at last precipitated a pale yellowish sediment; he washed the sediment, and put a part of it into a glass faucer over the fire, as it calcined, one part became white, the other remained yellow. Warm water poured on this calcined substance, became yellow, which clearly evinces, that those waters contain a vitriolic acid, which precipitated the *mercury* into a turpeth mineral, and what of this sediment that wou'd not calcine, shews that those waters contain a fixed alkaline salt.

But intirely to evince this matter, M. *Malouin* put the remainder of this sediment into a small retort, and by raising the fire, a genuine corrosive sublimate was found in the neck of the retort; there sublimed at the same time, a yellow substance, which was visibly a mineral sulphur; for when M. *Malouin* put some of this yellow matter on a shilling, in a red hot fire shovel, it presently took fire, exhaled the odor of sulphur, and turned the shilling black. He also made trials of this corrosive sublimate: he dissolved it in water, and divided the solution between two glasses; to one he put a *lixivium tartari*, which turned the solution into a red orange-color; into the other he put volatile spirit of sal-ammoniac; this turned the solution into a bluish white *coagulum*, all
evident

evident signs of its being a genuine corrosive sublimate. This experiment evidently shews, first, that those waters contain a marine salt; for no other acid will form with *mercury* a corrosive sublimate. 2^o. that they contain a vitriolic acid; for this acid joins the *bitumen* and with it forms a genuine mineral sulphur. Why this sulphur was not formed in the above glass-faucer, was owing to this *bitumen*'s exhaling before the vitriolic acid, in the turpeth mineral cou'd unite with it; why the former oily cream did not appear on the surface of those waters, when the solution of silver, in the nitrous acid was poured into them, was owing to the marine acid, which detached the nitrous acid from the *mercury*, as having a greater affinity with it than the nitrous acid has (see tab.), and with it precipitated to the bottom of the vessel; the nitrous acid, now disengaged from the *mercury*, attacks the *bitumen*, and dissolves and keeps it intimately blended with the water.

Tho' the above experiments abundantly prove the existence of a marine salt in those waters, yet M. *Malouin* has made other experiments, which put this matter beyond all doubt. He took some of the above precipitate, made with corrosive sublimate and those waters, and mixing it with some æthiops mineral, which every body knows is composed of *mercury* and sulphur, he put

this mixture into a *matrafs*, placed in a sand heat, with another inverted in it; he here had a true corrosive sublimate, which incontestably proves, that the marine acid was contained in the above precipitate, made by those waters and a solution of corrosive sublimate.

M. *Malouin* distilled those waters; there was no other difference observable in the sediment, left after evaporation and distillation, but that there was more of it after distillation; but what was most remarkable is, that when about $\frac{2}{3}$ of the water was distilled, he cou'd observe neither drops, *striæ* or vapors in the bolt-head; those are the forms all substances are known to rise in distillation, except in the distillation of very volatile substances, such as the *Ether*, volatile sal-ammoniac, &c. to discover what now came over, he changed the receiver 3 several times, and rectified the liquor, which he found wou'd now turn the violet tinctures greener than the water did, the first more than the 2d, and this more than the 3d; 60 pounds of this water left after evaporation, 3 drams 38 grains of a grayish colored matter, of a saline taste.

M. *Malouin* poured oil of vitriol on some of this saline concretion; a vapor instantly exhaled, which had the odor of the marine acid, blended with a bituminous one; he
put

put another parcel of this sediment into a silver spoon, made red hot ; it immediately took fire, exhaling a bituminous odor ; the flame was red and white only, nor was the spoon tarnished, all evident proofs, that sulphur is not one of the natural constituent principles of those waters.

M. *Malouin* put another parcel of this sediment into a crucible with its cover on, which he placed in a furnace ; when the crucible became red, he then took off the cover, a bluish flame appeared, exhaling the odor of brimstone, this is a second proof of the existence of the vitriolic acid in those waters. This vitriolic acid is, by the action of the fire, united in the crucible with the *bitumen* of those waters. This experiment further evinces, that a mineral sulphur cannot naturally be a constituent principle of any mineral waters, but is always the produce of fire, which during the evaporation of the water, unites the vitriolic acid with the *bitumen* or *petroleum*, which is found in a more or less quantity in all mineral waters, hot or cold.

M. *Malouin* left this matter in his crucible, while it exhaled any smell of sulphur ; he dissolved it after in water, and upon his pouring the nitrous acid into the solution, there presently arose as strong a smell as wou'd from a solution of a *hepar sulphuris* and

and the same acid. The substance that then precipitated, put on a live coal, burned as common brimstone wou'd.

This experiment informs us, that those waters contain a fixed alkaline salt, which during the above process, joins the sulphur then produced, by the union of the vitriolic acid with the *bitumen*, as was just now observed, and by this union forms a *hepar sulphuris*.

M. *Maloûin* filter'd this solution, and in a few days after he found a concrete salt, a nitre of a quadrangular form ; but willing to be thoroughly satisfied about the nature of this alkaline salt, he converted this quadrangular nitre, by the usual process, into a *lixivium*, and having filtered the solution, he poured into it the marine acid ; he here had crystals of a cubic form, a true regenerated sea-salt.

This experiment proves demonstrably that the alkaline salt in those waters is of the same nature as the basis of sea-salt.

It is this natural alkali or *natron*, which is found in most of all mineral waters, that has hitherto imposed universally on all analysts of mineral waters ; they took this *natron* for nitre ; what compleated their deception was their finding a *Glauber's salt* in the same waters, which having an imperfect resemblance to the crystals of nitre, and
not

not expecting that there was such a salt in *Nature* as a *Glauber's salt*, they readily confounded the one with the other, the *natron* of the ancients with the nitre of the moderns, tho' this was never yet found in any mineral waters whatsoever.

M. *Malouin* still pursuing his inquiries, put another parcel of this sediment into a retort, to which he fitted a receiver, and distilled it after ; he found in the neck of the retort a mineral sulphur, and in his receiver a pinguous liquor, which turned a tincture of violets green, and a solution of silver in the nitrous acid white, and formed a *coagulum* with a solution of corrosive sublimate ; all which are effects known to be produced by the volatile spirit of sal-ammoniac ; consequently this liquor is a volatile urinous spirit.

But M. *Malouin* wanting to discover how mineral substances come to produce a volatile urinous spirit, took some of those earths, found about *Smyrna* and *Ephesus*, which are known to be employed in those countries for the same uses we employ *Kelp* ; and mixing this earth with some of the liquid bitumens, he put this composition into a retort, placed in a reverberatory furnace, and fitted a receiver to it ; there came over a spirit, which perfectly resembled in its effects, the spirit he obtained from the sediment of *Plombieres* waters ;

waters; it turned the tincture of violets green, &c. exactly as the former spirit did.

M. *Malouin* extended this experiment further; he mixed other absorbent substances, such as kelp, and chalk with *petroleum*, and distilled those mixtures in a retort as above; he obtained a liquor, which by the same trials, manifested it was of an alkaline nature, like what he obtained by the same process from the sediment of those waters.

Hitherto M. *Malouin* made his experiments with the sediment of those waters in a *dry way* only, *i. e.* by fusion, as chemists term it; he next proceeds with his experiments in a *moist way*, *i. e.* by acid solvents, to discover the natural contents of those waters; accordingly he poured some common distilled water on a parcel of the same sediment, and seeing some of it remained undissolved, he poured off the first water, and added more of the same distilled water on the remaining sediment; he put those solutions into 2 different glasses, he poured oil of vitriol into each of those solutions. The 2d solution exhaled the odor of the marine acid, combined with that of saffron; this odor was here more sensible than when he poured the oil of vitriol on the same sediment in a *dry form*, which he conjectures was owing to the sediment's containing more, both of the alkaline salt and *bitumen* than its solution, which

which there prevented the greater action of the oil of vitriol on the marine salt ; this seems illustrated even in this experiment. The first solution of this sediment in this distilled water, mixed with the oil of vitriol, gave no signs of its containing a marine salt, tho' the second solution of the same sediment did. How this happens is thus : the distilled water dissolves first the alkaline salt in the sediment ; the water now impregnated with the alkaline salt, dissolves the *bitumen* in the same sediment, forming with it a saponaceous water ; this water saturated with this kind of *soap*, and perhaps with a *Glauber's salt*, which is contained in the same sediment ; and which is more soluble than the marine salt, so it was left with a part of the sediment undissolved, till by the affusion of fresh distilled water, it was dissolved, as in the above second solution of the sediment of those waters. The sediment that precipitated from this second solution, upon the admixture of the oil of vitriol, was the absorbent earth, now detached from the *bitumen* by the vitriolic acid ; the like absorbent earth is known to precipitate from a solution of alum with salt of *tartar*.

M. *Malouin* dissolved what he had left of all his sediments in a good quantity of common distilled water, filtered and evaporated it to a certain point ; he let it settle for

some time, to see what salts wou'd crySTALLIZE; upon pouring off the clear water, he found first, crystals of *Glauber's salt*, 2°. a marine salt, tho' not in so distinct *cubes*, but granulated, irregularly round, and somewhat flat, not very unlike those kind of crystals, that are formed from the bitterns in the salt works. However, that this granulated salt is truly a marine salt is evident, 1°. upon distilling this granulated salt, a true marine acid comes over, without any additament, 2°. when put on a live coal, it decrepitated, as sea-salt is known to do, 3°. a solution of this granulated salt, formed a *coagulum* with a solution of silver, in the nitrous acid; the precipitate it made, melted readily over the fire, and as readily exhaled; all evident proofs of this granulated salt's being a genuine marine salt.

M. *Malouin* gathered what remained of those sediments undissolved by the several lotions, and put it into a crucible to calcine; when the matter was dry, he presented it to the *magnet*, which plainly shewed it contained particles of iron; to be further satisfied, he dissolved some of this calcined matter in the vitriolic acid, and adding a little common distilled water to extend the acid, he put some of the powder of galls to it, which turned it black; this evidently shews

shews, that those saponaceous waters contain particles of iron, tho' by all the usual trials hitherto made with them, they never manifested their containing any such mineral, which probably is owing to the *bitumen* in those waters, which is kept dissolved, and intimately blended with both the water and its other saline contents, and by enveloping those ferruginous particles with a pinguous covering, prevents their manifesting themselves, upon the admixture of the powder of galls.

M. *Malouin* gives us here an excellent caution, not to be too hasty to pronounce such waters are not ferruginous, because they do not instantly, upon the admixture of astringent vegetable substances, manifest their ferruginous parts; this caution becomes so much the more necessary, as those trials with galls, have been hitherto universally looked upon as the only test in all experiments, made on chalybeat or ferruginous waters.

M. *Malouin* not willing to lose or overlook any part of the sediment of those waters, he here again gathered what remained on the filter, after the several lotions of this sediment; he found it had the same effects volatile alkaline salts have, to turn a solution of corrosive sublimate white, by which it appears, that those waters contain a volatile,

as well as a fixed alkaline salt; he poured the marine and vegetable acid on some of this absorbent alkaline earth; the vegetable acid dissolved it with effervescence, and by evaporating the solution, he obtained a *terra foliata*. He poured on another parcel of the same alkaline earth, the marine acid; he observed that the vegetable acid dissolved more of this alkaline salt, like what he had before in a former experiment from some of this sediment. The nitrous and vitriolic acid would dissolve none of this alkaline earth; the same is observable in other absorbent substances, such as crabs eyes, egg-shell powder, which are dissolved sooner, and more of them, in the marine and vegetable, than in the vitriolic and nitrous acid.

From all these experiments M. Malouin concludes; that the natural principles of the saponaceous waters of *Plombieres*, are a *bitumen*, of the nature of *petroleum*, a *vitriol of Mars*, a *marine salt*, an *absorbent earth*, *easily soluble and vitrescible*, and an *alkaline salt*, of the same nature as that of *kelp*. It is this alkaline salt, and the above absorbent earth, intimately mixed with the *bitumen* or *petroleum*, that render those waters saponaceous, gently deterfive and opening. They have been long reputed very efficacious in all the disorders of the Kidnies and bladder, in inflammations

inflammations of the eyes, in all inward heats of the bowels, especially of the lungs and stomach.

Third Class.

Of some of the ferruginous waters of France.

1713.

The principal of those waters are those of *Besse*, of *St. Pierre*, of *Passy*, near *Paris*, of *Forges* in *Normandy*, of *Veselay* in *Burgundy*, of *Caransac* in the lower *Rougue*, of *Vals* in *Dauphiny*, &c. all these waters contain nearly the same principles.

When *M. du Clos*, examined the waters of *Passy*, he found they contained but very little of either vitriol or iron ore, but a good deal of a gypseous matter, and a marine salt; they lay therefore quite neglected, till *M. Lemery*, the son, examined them anew in 1701. He discovered they contained a volatile, vitriolic acid, a marine salt, and a fine *crocus martis*. The taste alone sufficiently proves their vitriolic acid, but the changes the tinctures of turnsol, and galls make in those waters, leave no room to doubt their containing a vitriol; lastly upon evaporating those waters, a fine *crocus martis* is found, adhering to the sides of the pan. The earth found in the bottom of the pan, manifests its saline quality, by the impression it makes on the tongue; accordingly by torture of
fire

fire, it yields an acid liquor. The earth of *Passy-waters* has this singular quality, while it retains its acid salts, it will ferment with all acids, but after it has been calcined, by which one might reasonably expect it shou'd become the more alkaline, it never after wou'd ferment with any acid.

M. *Lemery* found those waters very beneficial in all obstructions of the bowels, *liver* and *spleen*.

A person long affected with disorders in his bowels, by drinking those waters, discharged an abscess by the *anus*, and recovered.

Another who drank them for 8 days, voided a pretty large stone, and by continuing their use, he voided a good deal of gravel, and was relieved from all his complaints.

A lady who used to vomit up her food, almost as soon as she had taken it, was in like manner relieved, by drinking those waters, assisting their operations now and again with some purging salts.

As those waters contain the same principles of those of *Forges*. M. *Lemery* thinks the *Passy-waters* are justly preferable to them, first, as they are situated so near the capital, being almost at one of its gates, and may be drank at their source, whereas those of *Forges* are known to lose considerable in their

their carriage thither, and in 8 days to have quite lost their virtues.

Some time in 1719, a new proprietor of the next garden happened to open an old well in his garden, which lay long neglected, only because it was mineral; however, upon digging further, they happened to discover 3 other sources, by which means the old spring was lost: but as fortune wou'd have it, the new springs were found to be better than the old one. The *Faculty of Paris*, willing to establish the reputation of those new *Passy-waters* upon a sure foundation, named some of their members in 1720 to examine those waters, M. *Reneaume* being one of those so appointed by the Faculty.

M. *Reneaume* considered the nature of the soil those waters are filtered thro'; the upper *stratum* is common *loam*, under which are several *strata's* of *argilla*, and under this an *iron ore*, and under this, the rock, thro' which the above *New Passy-waters* issue forth.

The first of those sources is the strongest, being more impregnated with the mineral; it exhales a light ferruginous smell, leaving on the palate a sharp, vinous taste, together with a kind of roughness and astringency, which remain some time, setting the teeth on an edge, as a solution of vitriol is known to do.

The

The 2d Source has a more sensible ferruginous smell, and yet it is not near so sharp, nor does it leave so great an astringency on the tongue as the first source; owing probably to some sulphur, which sheathes those ferruginous and other saline parts.

The 3d source abounds more in sulphur than in ferruginous parts, and probably it contains some nitre, as it leaves a coolness on the tongue which the others do not. Some compared the waters of this source to the *Pouhon* at *Spa*.

M. *Reneaume* compared the above 3 sources in the order now described, to the 3 sources at *Forges*, the *Cardinal*, the *Royal*, and the *Reinette*, with this additional circumstance, that the new *Passy-waters* are considerably more impregnated with the mineral, and retain it longer than the waters of *Forges*.

The waters of *Forges* contain but $\frac{1}{2048}$ of the mineral, and in 8 days they lose all power of striking any color with galls, whereas the new *Passy-waters* struck as deep a die 7 months after they were bottled, as they did the first day; they besides contain $\frac{1}{312}$, that is 4 times a greater quantity of the mineral, than the waters of *Forges*.

The virtues of *Passy-waters* are easily deducible, even from their sensible qualities. Their roughness on the palate bespeak their astringency, their ferruginous taste evinces their

their being attennuating and aperitive, their sulphur declares them inciding and purgative. Lastly, their nitre or vitriol pronounce them cooling and refreshing.

M. *Reneaume* experienced their efficacy in dysenteries, uterine hemorrhages, and melancholic affections.

However, those medicinal sources did not long enjoy this good name they acquired. A neighbouring gentleman, whether thro' envy, or perhaps willing to discover the like medicinal springs on his own grounds, fell a digging, and accordingly soon discovered 4 springs, exactly the same of his neighbour's, by which means the former were lost. However, the proprietor of the first medicinal springs by digging in his turn, recovered a spring, no way inferior to those he lost; upon this a law-suit was commenced; the government took cognizance of the affair, to prevent by any imprudent digging hereafter, the loss of such salutary springs to the capital, situated at one of her gates. The government, however, nominated Messrs. *Terret* and *Falconnet*, king's physicians, Messrs. *Bardon* and *Geoffroy* the younger, chemists, impartially to examine the waters of both parties in order to determine, which of the two merited most the confidence of the public.

M. *Geoffroy*, after the example of M. *Reaume*, examines carefully the *environs* of those sources; he there discovered besides *argilla*, *iron-ore* and sand, *marcasites*, which its true were observed by others; he however discovered they wou'd effloresce, as all *pyrites* are known to do, the very moisture of the air in the vault will resolve them into an oily liquor, which becomes a very good stiptic. M. *Geoffroy* distilled some of those *marcasites*; there came over first, an *acid liquor*, and after that, a milky sulphurous liquor, and by raising the fire, a mineral sulphur sublimed at the neck of the retort.

But what mostly abounded in the soil about those sources, and what attracted most his attention was a kind of *jelenites*, a fossil salt, composed of the vitriolic acid and a calcarious earth, to be found every where, intermixed with the above *pyrites* and *argilla*; he also discovered a natural *chalcitis*, or mine of vitriol, of a variegated color, with veins of red, yellow and white; it effloresces in the manner of all *pyrites*, and is covered with fine white *striae*.

M. *Geoffroy* proceeded next to the trial of those waters with galls in the usual way; heretofore it was thought sufficient to characterise a water to be of the ferruginous kind, if it struck a purple die with galls, or with any other astringent vegetable substance

stance; but it never before entered into any of their heads to judge *a priori* of the state of the mineral, contained in the water, from the appearances the same water exhibits upon its admixture with galls, &c. that is, whether it is highly attenuated and intimately blended with the element, water; or whether the water is richly or but poorly impregnated with it. M. *Geoffroy* forms his judgment, 1°. From the time the water takes, before it changes color; 2°. From the very nature of the color it imbibes; 3°. And lastly, from the time the water holds its color. If therefore a chalybeate water takes a considerable time (half an hour or more), before it strikes a color with galls for example, he infers from thence, 1°. That the mineral is highly attenuated; and as intimately blended with the water; the sulphurous parts of the vegetable astringent in such a case, require so much the more time to attract, and select the fine coloring particles, as they are the more intimately mixed with the vehicle, and if the color the water imbibes be of a bright blue, without any shade of red, this he thinks a strong argument of the minerals being highly attenuated; all coarse coloring stuff are known to strike a deep die; and lastly when a mineral water retains its bright blue color a considerable time, 1, 2, 4, 6, 8 days, he

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thinks this must be an incontestable argument of the strength of the water, of its being richly impregnated with the mineral, and its great unwillingness to part with it.

This seems to be countenanced by this known fact, that this color subsists after the affusion of a good deal of fresh water, where by the bye, it is curious to observe the several changes or shades it passes thro' before it intirely loses its color, *i. e.* before it lets go its mineral, a very strong proof of the high impregnation of the water. Now, it is quite the reverse in all trials made with weaker mineral springs, where the mineral is less divided, of course less intimately mixed with the water; the grosser the particles of any matter are, the less they mix with the fluid they are dissolved in; this is fully verified by the trials made with the 2d and 3d springs, the waters of the first yielded the fine blue color, and are therefore richly impregnated, but the waters of the other springs are not, they presently strike a deep or dark red color with galls; this passes thro' various degrees or shades to the *amethyst*, before it acquires the bright blue color, at the same time letting its mineral fall very fast, proof it was loosely mixed with the water; the reverse of this is observable in the first source; in the first place, it retains its mineral a considerable time, for it retains
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from the ROYAL ACADEMY. 365

its color; 2^o. When it does part with it, it does it slowly, without any effervescence, and more at the sides, than at the bottom of the vessel, as the other springs do; which is a strong instance of the highly attenuated state of the mineral in the water of the first source: however curious these experiments and observations may be, it must be confessed, that the most satisfactory trial of all mineral waters is by evaporation, judiciously managed; the sediment left after evaporation properly examined, must let us more perfectly into the knowledge of the natural principles of all mineral waters, and the quantity of the mineral they contain than any other trial whatsoever.

M. Geoffroy accordingly evaporated the *Passy-waters*, and dissolved some of their sediment in distilled rain-water, filtered and evaporated it after, which yielded him a *sal-Glauberi*; when we consider how this salt is artificially made, we shall easily comprehend, how it is produced in this process, the vitriolic acid in those waters is united to a metallic earth; this acid readily quits its metallic *basis* to join the alkaline *basis* of the sea-salt, as having a greater affinity with it, than the marine acid has, (See tab.) the very same thing happens every day in our laboratory; by pouring oil of vitriol on decrepitated marine salt, we compose a *sal-Glauberi*

Glauberi (that those waters contain a sea-salt, we shall see presently.)

M. *Geoffroy* put another parcel of this sediment into a crucible to calcine, which when presented after to the magnet, fully displayed its ferruginous *nature* by adhering to it.

And here M. *Geoffroy* observes, that the great benefit arising from all ferruginous waters are chiefly owing to the greater division, to the highly attenuated state those particles of *iron* are in, which renders them so efficacious in the removal of the most rebellious chronic maladies; daily experience furnishes us with the proof; the common preparations of iron are known to be often attended with unexpected success in many stubborn, rebellious cases; but it must be confessed, no human industry cou'd hitherto so perfectly subtilize those preparations of iron, in any wise equal to these medicinal potions, bountiful *Nature* has every where supplied us with, in those and all such ferruginous springs. And this fully justifies the conduct of the honest, disinterested physician, who sends early his patients to those sensitive springs, so aptly prepared by the hand of *Nature* to remove their stubborn, rebellious complaints; tho' he may, and too often does unjustly suffer in his character from the unthinking many, who always look upon
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his sending his patients to drink waters, as a mere subterfuge, purely calculated to get rid of them, and as they wou'd suggest, a tacit confession, he either mistook the case, or at best, did not know what more to do for them.

As all researches of this kind shou'd ultimately tend to the advancement of natural knowledge for the common good of mankind in general, so one of M. *Geoffroy's* chief ends in all his inquiries into the natural principles of those ferruginous waters, was to imitate them, so as they may be of some use, where either convenience or circumstance did not permit the valetudinarian to go to the source, agreeable herein to the views of the Academy in directing those *analysis* to be made *; several before him attempted the same thing, with this view only, to give their artificial mineral water the smell and taste of the natural, and with the powder of galls to strike the same color as the natural ferruginous water is observed to do, without ever taking into the account the difference in the color, and the several changes it is observed to pass thro', as the mineral water happens to be impregnated with a mineral more or less attenuated, and intimately mixed with the vehicle; for as it was before taken notice of, all that was

* See before p. 316.

required

required in both natural and artificial chalybeate waters was to strike with galls a purple die, to pronounce the waters, either natural or artificial, ferruginous; but to judge rationally of the strength of any ferruginous waters, the observator shou'd diligently attend to the several changes the waters passed thro', upon the admixture of galls, or any other astringent vegetable substance; for if you dissolve but 2 grains of vitriol in a *Paris* pint of common water, the smell and taste of a ferruginous water will be sufficiently distinguishable, and by the usual *test*, with the powder of galls, will strike as deep a die, as the old *Passy-waters* did: it is true it is not durable, and why shou'd it? But if you wou'd have this artificial mineral water strike a color 24 hours after it is made, instead of 2, you must put 4 grains of vitriol to a that quantity of water; but all this while, we have not discovered the quantity of ferruginous principles the natural water contains: to discover this, we must compare the quantity of sediment, both waters (natural and artificial) leave after their evaporation. M. *Geoffroy* had the patience to pursue this inquiry; he found that 6, 8, 10 grains of vitriol to a *Paris* pint of water, had many sensible effects of most ferruginous waters, and wou'd, even after being made 5 days, strike a fine purple die, which by
degrees

degrees became of a beautiful color, and what is more, this same artificial water, kept close corked for a month, did strike a blue color.

But to imitate those waters to all sensible appearance, as well as in the quantity of sediment, they leave after evaporation, M. *Geoffroy* found, that 20 grains of vitriol to a *Paris* pint of water was nearly the exact proportion so much natural ferruginous water contained: he went further, he evaporated this artificial water, and found the sediment it left, resembled exactly that of the natural water, viz. *selenitical crystals*, lying on a ferruginous bed, the sides of the vessel being lined with the same saline concretions.

The great contest that arose between the proprietors of the *New Passy-waters*, excited the curiosity of some chemists, to see whether those waters really merited this great bustle made about their property. M. *Boulduc* the younger, among others, made some few trials with them at the time, but finding some things omitted, in the accounts given after of those waters, he examines them anew this year 1726, where, with that great exactness in all chemical processes he is remarkable for, demonstrated every constituent principle of those waters, without supposing any, which no body that had hitherto examined them,

was ever able to do. I therefore thought the reader wou'd be pleased to have his account of these waters, not so much to know their mineral contents, for that is pretty well known already ; but as I look upon his manner of handling this so intricate a subject, the *analysing of mineral waters*, to be a *master-piece* in its kind, and in that sense, might serve as a *clue* to all future analysers of mineral waters, how to conduct themselves, thro' this *labyrinth* of *Nature*.

The first thing he tells us that struck him, and which escaped all that went before him was, that as soon as this water felt the heat upon evaporating it, it began sensibly to ferment, which continued till all its mineral was precipitated : the second was, that after he had dissolved this sediment in distilled rain water, and evaporated it over a gentle fire, he obtained a yellow salt, which exhaled a most penetrating vapor, which neither he himself, nor those present cou'd define ; some thought it resembled the vapors of burning brimstone, others compared it to that arising from the flowers of *lapis hæmatitis* dissolved in spirit of sal ammoniac, and some to other things ; this kind of salt and the vapor it exhaled has been overlooked by all former analysers. This water exposed in a bottle to the air, during the summer, is observed gradually to lose
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of its transparency, and the more so, when set to evaporate, casting forth several bubbles of air, which when they arrive at the surface of the water, are there dispersed; all this time, a gentle conflict between the contents of those waters is very visible; and when a glass of this same water is put under the glass receiver of the air-pump, it is seen to bubble more considerably than some spiritous liquors, darting up large bubbles of air, such as are seen in all *effervescences*, in proportion as the contained air is exhausted.

The sediment these waters leave after evaporation, appears in this order, the ferruginous part, as being the heaviest, lies at the bottom of the pan; over this a fine white powder, and over this powder, some transparent brilliant crystals are seen, the whole being covered in a confused manner, with a whitish saline substance, which for the most part deliquiates in the air.

Now, the artist's business is to separate these several substances, to examine them apart, to demonstrate in what condition each was in the mineral water, before it was decomposed, or had deposited its mineral. The very taste of those waters is sufficient to prove their ferruginous parts; the ferruginous sediment found in their channels, leaves no room to doubt, but it is iron that had

been dissolved, but now abandoned by its solvent ; now the question is, what is this solvent, that has in the above process abandoned this iron ?

It is known by experience, that any of the 3 mineral acids, the vitriolic, nitrous and marine, will dissolve this sediment, and that *galls* will strike as deep a color with a solution of this sediment, as if the filings of steel had been dissolved in the same mineral acids; and when this same ferruginous sediment is calcined, and presented after to the *magnet*, it visibly betrays its ferruginous origin ; two incontestible proofs of this part of the sediment being ferruginous, *i. e.* perfect iron. The same experience informs us, that a solution of iron in any of the above acids, will never yield that sharp, pungent taste, remarkable in all ferruginous waters, which some have compared to a vinous taste ; what then is this solvent of iron, that imparts those qualities to all ferruginous waters ?

All the chemists who have hitherto analysed mineral waters, have always supposed those waters contained *some thing volatile and sulphurous*, but not being hitherto able to extract, much less to demonstrate it to others, concluded it was so very volatile and fleeting in its own nature, as not to be retained in the closest bottles, but would escape, *maugre* all their industry and care.

HOFFMAN

Hoffman

Hoffman in *obs. chem.* considers this *volatile spirit* as the solvent of iron. M. Lemery in his accounts of *Passy-waters* *, acknowledges he perceived a very *volatile spirit* in those waters.

And the great Stahl, in his treatise *de Acidulis et Thermis*, confesses the same thing, but affirms *this vitriolic acid may be separated, or extracted from these acidulae.*

M. Boulduc considering the candor and abilities of those great men, began to reflect with himself that the thing must surely be possible; he accordingly set about extracting this volatile solvent; for this purpose, he separated the soluble, saline part of the sediment, and having dried it over a gentle fire, he distilled it in a retort by itself, without any additament; he here had the pleasure of seeing vapors, passing over into his receiver, which insensibly formed themselves into *striae*, the appearance all volatile spirits make in distillation, and by increasing the fire, a true mineral sulphur sublimed at the neck of the retort; the operation over, he found in his receiver, a lightly acid liquor, that exhaled a most penetrating odor of burning brimstone, which no man cou'd long smell to. In short, that sulphurous spirit, or highly volatile, vitriolic acid, the genuine solvent of iron, that hitherto supposed fleet-

* See before, page 357.

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ing spirit of all ferruginous waters, which in its kind is as penetrating and pungent as the spirit of sal ammoniac is among the volatile alkaline spirits.

This volatile acid spirit, meeting with the iron in the bowels of the earth, forms with it a natural vitriol, which the artists cou'd never yet imitate. It is this natural vitriol that gives all ferruginous water their sharp and vinous taste, and the volatile penetrating vapor they are known to exhale.

Now, shou'd it be asked, how come those waters to lose those qualities, their peculiar smell and taste?

This will be easily understood, when we consider that all mineral waters contain naturally an alkaline earth; when therefore those waters have stood, exposed to the air for some time, or have been set to evaporate, or put under the glass receiver of the *air-pump*, their natural principles begin to separate and disunite, according to their different specific gravities, and different degrees of attractions, that is, they begin to effervesce; this gentle intestine conflict soon changes the natural *arrangement* and union of their several constituent parts; the ferruginous parts, as being the heaviest, fall to the bottom of the vessel; the volatile, vitriolic acid spirit, meeting in the above conflict with the alkaline salt, unites with it, and then
forms

forms that concrete salt we call *Glauber's salt*, by which means the waters lose all their peculiar qualities, tho' the volatile acid still remains, united it is true, to another *matrix*, the alkaline salt contained in all mineral waters in the *Glauber's salt*.

Something similar to what here happens, is every day's experience in our laboratory. When an alkaline salt is added to a solution of any metallic substance in any of the mineral acids, the acid solvent quits the metallic substance to join the alkaline salt, as having a greater affinity with it (see the tab.) The metallic substance is then precipitated. Now, if one shou'd taste this solution after this change happened, he wou'd find that the former metallic taste was intirely destroyed. The very same thing happens to all mineral waters after their decomposition, after they have precipitated their mineral, which is what gives them all their peculiar qualities, and what renders them so effectual in the several cases they are drank for.

By this process it is evident, that it is the alkaline salt that excited the effervescence in those waters, which destroys their natural *arrangement*, and breaks that union between the solvent volatile acid spirit, and the ferruginous parts; those parts thus abandoned by the solvent, precipitate to the bottom of the vessel; it is not therefore to be wondered,

ed, that the waters shou'd then lose their natural taste and smell, and all the other qualities and effects depending on their union. This total change that now happens to those waters, is what made all former analysers of mineral waters conclude, that their volatile acid had exhaled, which left the waters insipid, and without any virtue: whereas this volatile acid is still retained in the *Glauber's salt* that is then formed, as was before taken notice off.

M. *Boulduc* in order to discover the true contents of this sediment, dissolved the saline concretion in distilled rain water, filtered and evaporated it after; he obtained some fine transparent rhomboidal crystals, lightly bitter and somewhat rough on the palate.

M. *Stahl* must have observed this quadrilateral salt in mineral waters; for he says in his treatise *de salibus*, that those *acidulæ* contain a concrete salt, which resembles that artificial salt of the shops, known by its inventor's name, *Glauber*. When this *Glauber salt* is distilled, it readily parts with its acid pure and unmixed, the least degree of fire being sufficient to bring it over; what remains in the retort appears a confused white saline powder, which being dissolved in distilled rain water, leaves on the filter, an alkaline earth, that ferments with all kinds of acids; the water that passed the filter,

filter, being evaporated, yields a *Glauber's salt*, easily discoverable, 1°. by the figure of its crystals in quadrilateral columns, terminated by *bases* of the same figure, 2°. by its bitter taste, followed by a coolness on the palate, 3°. by its being soluble in its own weight of water, which no other concrete salt is ; lastly, by its readily running into a *fluor* over the fire. All this time, it evidently appears that this *Glauber's salt* did not naturally pre-exist in those waters before their decomposition, and not before the volatile acid solvent had abandoned its metallic *basis*, to join the alkaline earth in the waters, and this is a 2d proof, that this volatile acid does not exhale or fly off, as was hitherto universally believed ; but is still retained in those waters, in that concrete salt it then forms, in *Glauber's salt*. And tho' it is sufficiently obvious, that a *Glauber's salt* did always exist in *Nature*, tho' not always properly attended to ; yet we are indebted to *Glauber* for having discovered it ; for by this discovery, we now know, that one of the constituent parts of either the natural or artificial *Glauber's salt* must be the alkaline *basis* of sea-salt.

From M. *Boulduc's* discovering a *Glauber's salt* in those waters, he naturally inferred they must also contain a marine salt, tho' he cou'd not hitherto get it to crystallize ;

he tells us what confirmed him in this conjecture was, these waters precipitating a solution of silver in the nitrous acid, as sea-salt is known to do, and this precipitate with equal parts of cinnabar, forming a genuine corrosive sublimate, which no other but the marine acid cou'd do.

In this process the marine acid in the precipitate quits the silver to join the *mercury* in the *Cinnabar*, as having a greater affinity with it than it has with the silver (see the tab.); this marine acid now joined to the *mercury*, sublimes with it, as in the usual way of making corrosive sublimate.

Tho' this process sufficiently proves the existence of a marine salt, in the mineral waters of *Passy*, yet M. *Boulduc* was not satisfied, till he cou'd produce the very identical sea-salt in fair cubic crystals; he accordingly set the solution of the saline concretion of his sediment to evaporate; after he had removed the quadrilateral crystals, and carefully seizing the instant a 2d crystallization appeared, to remove the pan from off the fire, he left it exposed to the cold air, and in some short time after he found his marine salt easily discernable, 1°. By its cubic form; 2°. By its peculiar saline taste; 3°. By its decrepitating on the fire; 4°. By its precipitating a solution of silver in the nitrous

nitrous acid; lastly, by all the other known qualities of sea or marine salt.

After this marine salt had been separated, he had left a fat, yellowish water, unctuous to the touch, known for the *Mother-ley* of common salt; upon evaporating this unctuous liquor, it became red, exhaling at the same time a smell of *bitumen*; being composed of a *bitumen* and sea salt; for upon pouring the oil of vitriol into it, the marine acid is observed sensibly to *exhale*, and upon adding salt of tartar to it, the *basis* of sea-salt is precipitated.

M. *Boulduc* wanted to separate this salt from this pinguous mineral oil; there are two ways to compass this matter, the first is to employ either bullock's blood, fish-glue, or whites of eggs, as the salt boilers do; these glutinous substances inviscate this bituminous substance, and rise up with it to the surface in the form of a *scum*; the salt remains in the bottom of the pan, in a granulated form; the 2d process bespeaks more of the artist, and is this: this *mother-ley* with a proportionable quantity of the oil of vitriol is distilled together in a retort, the vitriolic acid detaches and dislodges the marine acid in the *mother-ley* from its *basis*, as having a greater affinity with it than its own acid has (see the tab.) the marine acid being now at liberty and freed from its *basis*,

and besides, being volatile in its own nature, readily passes over into the receiver, while its *basis* remains in the retort with the vitriolic acid, and with it forms a *Glauber's salt*; at the same time, some of this same vitriolic acid unites with the *phlogiston*, or inflammable part of the *bitumen*, as having the greatest affinity with it of all other substances; and with it forms a true mineral sulphur.

The very same thing happens, when the intire sediment is distilled in the same manner. The vitriolic acid in the *Glauber's salt* of this sediment, meeting this *bitumen*, always inseparable from sea salt, quits its alkaline *basis* in the *Glauber's salt*, to join the *phlogiston* in the *bitumen*, and with it forms a true mineral sulphur, which is found sublimed in the neck of the retort; but all this time, it is evident, that this sulphur is the genuine product of art, and never to be found naturally in any ferruginous waters; tho' many, even this day are of the contrary opinion, and very confidently tell us, such waters have a sulphurous taste, they therefore must contain sulphur; whereas, had they considered, that sulphur can never naturally mix with water, and for that reason, is always seen floating on its surface, they wou'd give up this fond opinion. To mix sulphur with water, it must be first combined

bined with some alkaline salt, forming therewith a *hepar sulphuris*, which presently betrays itself by its rotten smell, like that of hatched eggs; no such smell has ever yet exhaled from any ferruginous waters. But besides, when any acid is poured on this *hepar sulphuris*, sulphur is instantly precipitated, the water turns milky, and is of a more or less yellowish color, the rotten smell becoming at the same time abundantly more disagreeable.

But no such thing happens to those waters, upon the admixture of an acid, nor do they precipitate any mineral; and tho' they should be evaporated after the addition of an acid; they still preserve their limpidity, and never exhale the least rotten smell, nor precipitate any thing; all which are incontestable proofs, that ferruginous waters do not contain naturally any sulphur.

Nitre hitherto supposed to be one of the natural constituent principles of those cold ferruginous waters, stands still upon a more precarious footing than even their sulphur; for besides that nitre is not a *fossil salt*, as M. *Lemery* has incontestably proved*, and therefore never to be found in the bowels of the earth, where those sanative springs are elaborated, where they are impregnated with

* See Vol. IV. Of Nitre.

those

those natural principles they bring with them to the surface of the earth, yet it is scarce possible this nitre cou'd escape so diligent an inquirer as M. *Boulduc* ; the more so, as he assures he made all the inquiry he was able, in order to discover whether those waters contained nitre, as well as he discovered all their other different constituent principles.

But as to the *bitumen*, this is very manifest in those waters ; even the drinkers can and do discover it by the greasiness of their *goblets*, which some indeed attribute to the neglect of the servants in not rinsing the glasses. 2^o. upon evaporating those waters, it is this *bitumen*, or mineral oil that forms that white cream or crust on their surface : lastly, the *empyreuma*, which is sensibly perceived, after the distillation of those waters, is most certainly owing to this same *bitumen*.

The white earthy substance found on the *filter*, is indisputably the above absorbent alkaline earth, which is the primary cause that decomposes those mineral waters, that precipitates their ferruginous mineral ; it is that it turns a tincture of violets green ; that prevents their curdling the milk.

Lastly, as to the *jelenites*, this is a *fossil salt*, which appears in fine transparent rhomboidal crystals.

This salt has been hitherto looked upon as indissoluble in water, and on that very account

count, some deny its being a salt; but the reason why this *selenites* is so hard to be dissolved is, that it has taken in its crySTALLIZATION more calcarious earth than was necessary, or its acid could dissolve; this earth crusts over the real salt, by which means the water cannot come at its acid; this selenitical salt begins to appear, when about half the water is evaporated in fine *striæ* or filaments, which increasing every instant, become at last too heavy to remain any longer suspended, and so fall to the bottom of the pan in the form of pellucid crystals, which at first sight appear to be rhomboidal, but upon a closer view, are rather quadrilateral.

To be certain of the composition of this selenitical salt, M. *Boulduc* melted it in a crucible, together with salt of tartar, adding some *phlogiston*, to hasten its fusion; he dissolved it after in boiling distilled rain water, filtered and evaporated it to a certain point, which produced him a *tartarum vitriolatum* of an octoëdric figure, hard, and bitter on the palate; this process evidently shews that this salt contains a vitriolic acid, which with the tartar employed, forms a *tartarum vitriolatum*.

M. *Boulduc* has likewise been able to dissolve this same selenitical salt in water, with the assistance of a gentle heat only; he poured

poured on this solution *lixivium tartari*, which precipitated a good deal of earth, soluble in any of the mineral acids.

And thus has M. *Boulduc* conducted himself from one process to another, till he had distinctly separated the several different saline concretions contained in the sediment of his waters, which he has been able to produce, *viz. a natural vitriol, a Glauber's-salt, a marine-salt, a liquid bitumen or mineral oil, an alkaline earth and a selenites*; all which being intimately blended in the pure element water, elaborated and filtered after; in traversing the several *strata's* of the earth, they necessarily pass thro', they come to us, like so many medicinal potions, ready prepared by the hand of *Nature*; and as we know by experience the great efficacy of every one of these saline substances, and their being soluble in our juices, all to the selenitical salt, we may naturally conclude that such waters as are impregnated with such mineral and saline contents, do promise to be cooling and aperitive in the general. And as to the selenitical salt, on the very account of its not being soluble in our juices, has probably a very great share in producing all the good effects of those waters; for its *spiculæ* remaining intire, by the *stimulus* they excite in circulating with our juices, they must necessarily restore the spring of the vessels, invigorate their oscillations, by which means obstructions are removed, and the several secretions restored to their natural standard.

M. *Boulduc* observes here the unjust prejudices of some against all *analyses* of mineral waters made by fire, which say they destroy the natural arrangement of all bodies exposed to its action.

But

But for ever to stop the mouths of all such cavillers, M. *Boulduc* proposes here two plain easy processes, which every man at his leisure may repeat.

He takes his chalybeate water, after it has precipitated its ferruginous parts; he pours 8 ounces of the water of the first source on as much highly rectified spirits of wine; the mixture becomes muddy that very instant; in a little time after the selenitical salt falls to the bottom of the glass; he here decants the clear water, and adds to it from 4 to 5 ounces more of the spirits of wine; in some short time after, the *Glauber's-salt* forms itself into long, regular crystals, intermixed with some of the same selenitical or *rhomboidal* crystals; he here decants the water for the 3d and last time, and adds from 4 to 5 ounces more of the spirits of wine to it; the marine salt is here formed into small granulated crystals.

The 2d process is to expose this mineral water to be frozen, observing to remove the ice as it forms, till the water employed is reduced to $\frac{1}{4}$ or thereabouts; with spirits of wine as above, you will more expeditiously obtain the same salts and in the same order, and with a less quantity of the spirits; but then this spirit shou'd be highly rectified, otherwise the marine salt will remain at the bottom, mixed with the mineral oil.

Surely after this, nobody can pretend to dispute the aptness of those *analyses* by fire, to discover the natural principles of those mineral waters, seeing the same principles can and are extracted from them, without the help of fire, by spirits of wine alone.

Of the waters of Forges in Normandy. 1735.

M. *Boulduc* analysed those waters also ; and tho' it was well known before, that their natural principles were the same, with those of the *New Passy-waters*, yet as M. *Boulduc* was obliged to pursue a different method here, before he cou'd discover their natural principles, so it was thought proper to subjoin here, what he has said on that subject, the more so, as it might serve as a guide to others to go by, when the first method they set upon had not satisfactorily conducted them to the thing they inquired after.

M. *Boulduc* informs us, that the motive that induced him to *analyse* those waters at this time was their being ordered for her majesty. M. *Boulduc* as being her majesty's apothecary, had the charge of having those waters brought fresh every day, to prevent any alteration in their principles ; he accordingly sent an intelligent person to *Forges* in *Normandy*, 12 leagues from *Paris*, to see them properly bottled and sealed, which by *relays* came every morning early to *Versailles*, where M. *Boulduc* made the usual trials with *galls*, before her majesty drank them, to see whether they had lost by the carriage any of their virtues, or had precipitated their mineral ; this furnished him with a sufficient quantity to make his experiments with ; for it is idle to think that a few bottles, nay gallons of this or any other water, will enable any man thoroughly to examine into, or discover their natural principles.

There are 3 sources of these waters at *Forges*, the *Cardinal*, the *Royal*, and the *Reynette* ; the *Cardinal* as being too strongly impregnated with the mineral, is seldom drank, few stomachs being
able

able to bear its weight ; the *Royal* is what is mostly used, and what her majesty drank ; the *Reynette* as being the weakest, is generally drank there at meals, mixed with wine.

All the 3 sources deposit in their channels a sediment, in all appearance a natural *crocus martis*. M. *Boulduc* had a good deal of this sediment sent him, together with what 1593 pounds of the waters of the *Royal* source yielded by evaporation, reduced from 4 to 5 pounds.

These waters at the source, and even after their arrival at *Versailles*, are clear and limpid, they have a ferruginous taste, and are lightly astringent on the palate, and exhale somewhat of a vinous odor ; but they lose all these sensible qualities in a few days, owing as it was hitherto imagined, to their volatile vitriolic acid's exhaling ; they soon after let fall their mineral, and much sooner in warm weather, or placed near a fire ; they begin first to grow muddy, then milky, and precipitate an ochery sediment after.

M. *Boulduc* tells us, he attempted to obtain the several principles of these waters separate, by employing the same method he used in his *analysis* of the *New Passy-waters*, but did not succeed.

All the trials with solutions of silver and mercury, in the nitrous acid, with the acid of vinegar, with *lixivium calcis*, with tincture of violets, and such other things usually employed, afforded him no light, as to their natural contents ; for all these scarce made any alteration, or disturbed their limpidity.

Salt of tartar it is true, turned them muddy ; but that was no great inlet into the knowledge of their constituent principles ; for they become mud-

dy of themselves, especially in open vessels, and in warm weather.

Their not curdling milk, and their striking a red color with galls, was all the previous knowledge of the nature of their contents he cou'd extort from them. Distillation afforded him no satisfaction; what they left was a confused yellowish sediment, nor wou'd spirit of wine decompose them, as it did the *Passy-waters*. Even evaporation managed with all care possible, did not much help him to discover the nature of their principles; it is true, that after the little intestine conflict was over, there appeared on their surface, small argentine pellicles, separate from each other; but these were soon confounded with the rest of the sediment, the whole appearing after a confused yellowish mass, of a light saline taste.

M. *Boulduc* thus disappointed by every trial he cou'd make with the waters themselves, turned all his views to their natural sediment, found in the channels they run thro'.

In the first place, when this sediment is dried even in the open air, and presented after to the *magnet*, it appeared to contain particles of iron; and after it has been roasted a little, the *magnet* attracted more of it: this sediment therefore contains iron, which is what gives it that brown color. Some of the same sediment turned a tincture of violets red, and fermented violently with all kinds of mineral acids; this sediment then contains both an absorbent and alkaline substance.

When the effervescence was over, the former rhomboidal, selenitical crystals began to appear; by this process this sediment yielded 3 different substances, which M. *Boulduc* by a very simple process had separate, by frequent lotion with common

mon distilled water ; for what is merely earth in this sediment is very fine and light, when therefore the water is agitated, this fine earth is kept suspended, as being considerably lighter than either the ferruginous or selenitical parts ; the water is then poured on a filter, more water is added while any earth wou'd mix with it, this earth when dried is whitish and highly absorbent ; the ferruginous parts heavier than the earth, but still lighter than the selenitical salt, is separated in the same manner, by repeated lotions, and when no more ferruginous parts wou'd mix with the water, the selenitical salt is found in the bottom of the vessel, in pellucid crystals.

From the success of this simple process, by which he separated the above 3 different substances, he naturally inferred, that he might obtain the same substances from the waters by evaporation conducted with judgment, not by continuing it in the usual way to ficcidity, till all the water was evaporated, but by seizing the instant the water appeared muddy, to take the bason or pan off the fire. When the bason was cold, he decanted the clear water, and poured the sediment on a filter, observing to wash the matter often with common distilled water ; this matter dried in the open air only, betrayed its ferruginous parts, and after it was lightly torrifed, it gave stronger proofs of its ferruginous quality, by adhering to the *magnet* ; having thus obtained the ferruginous parts of this water, he set the above decanted clear water to evaporate : there soon appeared on its surface a bright white pellicle, together with a whitish heavy substance, which soon fell to the bottom of the pan ; he here again took the pan off the fire, and decanted the clear part after, as before ; poured
the

the sediment on his filter, washed and dried it after ; this sediment was highly alkaline, fermented with all kinds of acids.

It is this alkaline substance that prevented those waters from curdling the milk, that turned the syrup of violets green, that decomposes those waters, by detaching the volatile vitriolic acid from its metallic *basis*, by which means they lose both their taste and smell : something similar happens every day in our laboratory, when to a solution of vitriol any of the absorbent substances, such as powder of *chalk*, *lime*, *Crab's-eyes* are added, a light effervescence ensues ; in this little intestine conflict the vitriolic acid quits its metallic *basis* to join this alkaline substance, as having a greater affinity with it, (see the tab.) ; hereupon the metallic *basis*, the ferruginous parts fall to the bottom ; the solution loses after all its former taste and smell, directly as all mineral waters are known to do, after they have precipitated their mineral.

As to the above brilliant pellicles, they are the selenitical salt, whose saline nature M. *Boulduc* had before clearly shewed, by transferring its acid to another *basis*, in the formation of his vitriolated tartar * ; he has here been able to compose it anew, by pouring a solution of *Glauber's-salt* on *lixivium calcis*, the vitriolic acid in the *Glauber's-salt* quits its alkaline *basis* to join that of the *calx*, and with it forms a true *selenites* ; but to obtain the above transparent crystals, pour the oil of vitriol by degrees on the same *lixivium calcis* ; let the mixture settle for a few days ; you will find after the above rhomboidal transparent crystals ; the vitriolic expels the marine acid in the *calx*, and uniting with it, forms those crystals in question, a true *selenites*.

* See p. 385.

After he had separated the above several salts from this water, there remained a yellowish, pinguous water, which after it had been left for some time over the hot cinders, and set to cool after, yielded a marine salt in fair cubic crystals.

It is here to be observed, that in the *analysis* of the *Passy-waters* the *Glauber's-salt* appeared first; it was the reverse here; the marine salt appeared in the *Forges* waters first; but as in the former case, M. *Boulduc* conjectured there must be a marine salt where there was a *Glauber's-salt*, tho' he had not then discovered it, so here upon his discovering a marine salt first in the *Forges-waters*, he inferred they must contain a *Glauber's-salt* also, nor was he mistaken; for he found it in the bottom of the pan, in the form rather of a fine sand than of a crystallized salt. But in order to obtain this salt in its usual form, M. *Boulduc* dissolved the above fine sand-like concrete salt in common distilled water, and exposed it after to evaporate in the air, where after some time he obtained pretty large crystals of a quadrilateral figure, a genuine *Glauber's-salt*.

There remained here also, as in the *analysis* of the *Passy-waters* a *mother-ley*, unctuous to the touch, bitter and disagreeable on the palate, and very difficult to be evaporated; but being kept some time over the warm coals, it at last exhaled the same odor *bitumen* thrown into the fire does; this *bitumen* is always in a liquid state in those ferruginous and most other waters, and always accompanied with a marine salt, one being never without the other.

It is this *bitumen* that gives that redish cast to a part of the selenitical, and to the greatest part of the marine salt upon their evaporation.

As

As these waters are impregnated with highly attenuated particles of iron, together with active penetrating salts, all intimately blended in the purest element, water, so it is reasonable to infer, that they are very capable of penetrating into the remotest stages of the circulating fluids of a human body, and there powerfully attenuate, and after dislodge any fizy, obstructing matter, and as these waters are gently stiptic and astringent, they naturally must remove all such disorders as depend on a relaxed habit of body, and that by gently bracing up and strengthening such relaxed fibres. There reigned from time immemorial a prejudice at *Forges*, that it was dangerous for the water-drinkers to sleep after dinner. M. *Dodart*, late first physician to his majesty, who went to those waters for his own health, used to sleep every day without his perceiving any inconvenience from thence.

A man of his eminence in medicinal knowledge was the only person who cou'd venture to overlook prejudices of so long standing.

Of the waters of Vezelay in Burgundy. 1705.

These waters are merely saline, being impregnated with a marine salt, and an alkaline earth; this earth fermented with all mineral acids.

Of the waters of Carensac in the lower Rourgue.

M. *Lemery* who analysed the waters of *Vezelay*, analysed also the waters of *Carensac*; they have a light acrid and vitriolic taste, but exhale no odor: 12 ounces after evaporation yielded 18 grains of a grayish sediment, inclining to a white, which appeared on the palate both of a saline and vitriolic taste; they are aperitive and purgative: they drink them in *Paris*, as they do the waters of *Forges*.

The End of Vol. III.

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